LOW VISION WORKSHOP HANDBOOK

"LOW VISION WORKSHOP FOR RESOURCE PEOPLE"

November, 1977

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TABLE OF CONTENTS

Section I Functional Implications of Low Vision
Section II Functional Evaluation of the Low Vision Student
Section III Treatment Options
Section IV Functional Ocular Anatomy
Section V Clinical Examination of the Visually-Impaired and Multiply-Handicapped Student
Section VI Vision Stimulation Techniques for the Multi-handicapped Child
Section VII Vision Stimulation for the Visually-Impaired Child
Section VIII Non-optical Aids
Section lX Introduction to Training with Near Aids
Section X Introduction to Training with Distance Aids

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SECTION I

FUNCTIONAL IMPLICATIONS OF LOW VISION (EPIDEMIOLOGY)

This chapter will outline the philosophy of care pertaining to the low vision patient. An appropriate psychological set on the part of the examiner is as important as the patient's psychological set, if optimum services are to be provided.

I. Definition of Low Vision

II. Definition of Blindness

III Psychology of Low Vision

IV. Chart Describing New Proposed Terminology to Define Blindness and Visual Impairment.

LOW VISION - EPIDEMIOLOGY

Reading: Faye - pgs 1-13; 203-252

Newman - pgs 10-23; 39-66

Mehr-Freid - Pgs 1-24

I. Low Vision - a definition that we'll be using is found in Mehr-Freid. It states that low vision is any reduction in visual acuity/fields that prevents an individual from performing a task they desire with best conventional lens correction.

We'll want to know how this philosophy affects the patient care program as opposed to old definition of low vision:

legal blindness - 20/200 - Total Blindness
partial-sight (low vision) 20/70 - 20/200
normal vision - 20/70 or better

II. Definition of Blindness

In order to obtain services, an individual must fall into the clinical category of having 20/200 acuity or worse or less than 20° Fields. The problem with this definition is:

1. It does not account for the myriad of factors that can affect acuity that range from lighting, chart style to apprehension.
2. It is not a functional measure. (i.e. it does not measure how well someone uses the remaining vision. One example to be discussed will be adventitious vs congenital losses
3. There are two types of acuity: clinical and functional measurements. These will be discussed

in greater detail throughout the lectures, especially when we discuss case history, acuity measurements and Orientation and Mobility. We will touch on the concept of functional vs clinical acuity as it pertains to the legal definition of blindness.

Functional	Independent	(legal blind)	Dependent
Clinical	20/20	(20/200)	Total Blindness

(see classification of Visual Performance Chart on Next Page)

How will the functional classification of legally-blindness affect your patient management and approach to the care of the patient with a visual impairment? Would you believe that some people are afraid of receiving an enhanced level of visual functioning??

Do professionals have stereo-types of legal-blindness as totally dependent people? How does this affect patient care and the patient?

(see Robert Scott, "The Making of Blind Men" Russell Sage, Foundation, 1969)

(see "Workshop on Low Vision Mobility" published by Veterans, Administration, Dept. of Medicine and Surgery, Washington, DC 20420, Chap. 6)

(see Alberto Valvo "Sight Restoration After Long Term Blindness" American Foundation for the Blind., 1971)

A discussion regarding the statistic that 85% of the "legally-blind" population have useful residual sight will give the student insight into the changes in philosophy of care that have come about with the beginning recognition of low vision services.

III. Psychology of Low Vision

The theme that will run throughout this seminar series will be two fold:

1. Reinforce the residual vision so the client won't dwell on the blindness.
2. The entire service should have a positive, success-oriented approach.

The specifics will be presented in subsequent lectures and in your readings. However, you should be very conscious of these two goals when you are providing any services to the visually-handicapped.

We must approach the problems of:

1. Adventitious vs Congenital losses
2. Psychological Set of the Examiner is important
3. Multi-disciplinary Approach
4. Understanding of Pathology
5. The affect of "legal blindness".
6. Deprivation of services as a hindrance of success because of our 20/200 criteria and fear of getting better vision than 20/200.
7. Cosmesis
8. The techniques of a psychologically successful exam, treatment and training programs will be presented. Keep in mind the psychological concerns of the examiner in these lecture presentations.

(see Mehr, Helen; Mehr EB and Carrol Ault "Psychological Aspects of Low Vision Rehabilitation" Amer J. of Optom and ARCH of Amer. Acad. op Optom. August 1970)

Additional References on All Lecture Topics Today are Available Upon Request to lecturers.

CLASSIFICATION OF VISUAL PERFORMANCE

(NEAR-) NORMAL		LOW VISION		BLINDNESS		
Normal	Near-normal	Moderate	Severe	Moderate	Severe	Total

VISUAL IMPAIRMENT (describes the performance of the visual system)

VISUAL ACUITY:						
1.6 1.0 1.25 0.8 20/12 20/25	0.6 0.4 0.5 0.3 20/30 20/60	.25 .16 .20 .12 20/80 20/160	.10 .06 .08 .05 20/200 20/400	.04 .025 .03 .02 20/500 20/1000	<.02 HM, LP	zero NLP

VISUAL FIELD:						
			20°	10°	5°	0°

VISUAL DISABILITY (describes the (in-)ability to perform visual tasks)

(NEAR-) NORMAL		LOW VISION		BLINDNESS		
Normal	Near-normal	Moderate	Severe	Moderate	Severe	Total
can perform all visual tasks		needs aids for detailed visual tasks		needs aids/other senses for gross visual tasks		
		near-normal with aids	subnormal with aids	aids as adjunct	vision as adjunct	no vision

GUIDELINES FOR BENEFITS:

no	slight	moderate	severe impairment / disability			
				profound impairment / disability		

AVOID:						
"legally seeing"			"legally blind"			

(NEAR-) NORMAL		LOW VISION		BLINDNESS		
Normal	Near-normal	Moderate	Severe	Moderate	Severe	Total

Alternative definitions:

		LOW VISION				
NORMAL	NEAR-NORMAL	Moderate	Severe	Profound	NEAR-BLIND	BLIND

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August Colenbrander, M.D., Chairman
Pacific Medical Center, P. O. Box 7999
San Francisco, California 94120, U.S.A.

DEFINITIONS OF BLINDNESS

Definition of Legal Blindness:

A person is legally blind who has a visual acuity of 20/200 in the best eye with best correction and/or a visual field subtending on an angle of 20° or less.

What does that tell you about the person? What is the first thing you think of when you read that definition?

There is an increasing movement to do away with that definition of legal blindness. There are so many definitions of blindness, legally blind, partially sighted, low vision, that we really don't know exactly who it is we're talking about when we talk about the low vision person.

Dr. August Colenbrander, an ophthalmologist specializing in low vision, in conjunction with the World Health Organization has proposed some new definitions or classifications with a different emphasis. Following is a list of definitions relating to low vision and blindness. See if you can pick up where his main emphasis is placed in devising these definitions.

Terms

1. Normal or Near Normal Vision - ability to perform all visual tasks adequately without special aids.
2. Low Vision - ability to perform tasks normally requiring detailed vision without special visual aids.
3. Moderate Low Vision - ability to reach near-normal performance with aids.
4. Severe Low Vision - the ability to perform even with aids is at a reduced level.
5. Blindness - inability to perform tasks which normally require gross vision without increased reliance on other senses.
6. Moderate Blindness - the person uses other senses to supplement vision in the performance of tasks.

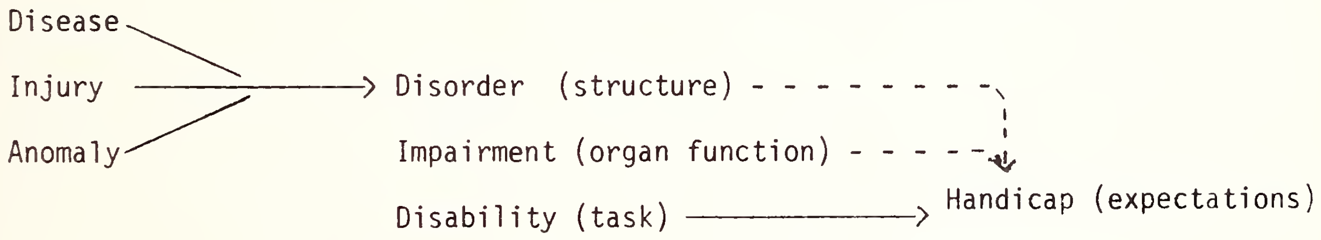
7 Severe Blindness - the person uses vision to supplement the other senses in the performance of tasks.

8. Total Blindness - the person uses other senses as substitutes for vision in the performance of tasks.
9. Visual Impairment - refers to the organs of vision. A disease, injury or congenital disorder interfering with the organ function causes a visual impairment.
10. Visual Disability - refers to the abilities of an individual, not to the condition of the eye. The degree of disability can be reduced by aids and/or training that enhance the impaired functions.

11. Visual Handicap - refers to expected performance. A disability interfering with a task the individual is expected to perform causes a handicap. A handicap may be reduced by modification of the expected task.

(NEAR-) NORMAL		LOW VISION		BLINDNESS		
Normal	Near-Normal	Moderate	Severe	Moderate	Severe	Total
Can perform all visual tasks		needs aids for detailed visual tasks		needs aids/other senses for gross visual tasks		
		near-normal with aids	subnormal with aids	aids as adjunct	vision as adjunct	no vision

INTERRELATIONSHIP OF IMPAIRMENT, DISABILITY AND HANDICAP



Reference: A. Colenbrander, M.D., B. Spivey, M.D., Classification of Visual Performance, American Academy of Ophthalmology and Otslaryngology Committee on Terminology.

REFERENCES

1. Clinical Low Vision

   Eleanor Faye, MD

   (Little, Brown and Co.)

2. Low Vision Care

   Edwin Mehr, OD and Allan Freid, OD

   (Professional Press)

3. The Care of Low Vision Patients

   Julian Newman, O.D. - Editor

   (AOA Publication)

4. Reading Aids for the Partially-Sighted

   Louise L. Sloan, Ph.D

   (Williams and Wilkins)

SECTION II

Functional Evaluation of the Low Vision Student

This section will discuss adaptations of "Functional Vision Screening For Severely Handicapped Children" by Langley and DuBose. Methods of functionally evaluating the multi-handicapped and non-handicapped child will be covered, along with specific suggestions for evaluating near, intermediate, and distance vision. Procedures for referrals to low vision examiners will be described.

I. Description and Adaptation of Functional Vision Screening form
II. Visual Posture/Behaviors
III. Near Vision
IV. Intermediate Vision
V. Distance Vision
VI. Visual Fields
VII. Travel Ability
VIII. Illumination/Glare
IX. Referral Procedures

Functional Vision Screening for Severely Handicapped Children

BETH LANGLEY, M.A.
REBECCA F. DUBOSE, PH.D.
Ms. Langley is educational diagnostician and Dr. DuBose is associate professor, Faculty of Special Education, Model Vision Project, George Peabody College for Teachers, Nashville, Tennessee.

Abstract: *Ophthalmologists traditionally have been unable to provide teachers and parents with useful information about a severely handicapped child's functional vision. Literature concerning the assessment of vision in handicapped children is reviewed and a guide is proposed for use by teachers in evaluating the severely handicapped child's functional vision.*

Severely handicapped children with some form of visual impairment are often placed in educational settings accompanied by inadequate reports giving some indication of visual classification and an unintelligible description of the specific impairment. References are repeatedly made to the difficulties involved in assessing the child's visual problems and to the hesitancy with which the ophthalmologist makes his judgment. In centers where a multidisciplinary team evaluates the child, vision experts tend to rely on the functional visual information provided by the classroom teacher or the educational diagnostician. A more practical assessment of visual functioning in severely handicapped children will therefore become available if those agents most familiar with the child's everyday use of vision actually participate in the assessment.

This paper describes some of the difficulties found in testing the visual acuity of severely handicapped children, surveys formal and informal measures used in testing visual acuity or functional vision, suggests guidelines for teachers to use in observing visual behaviors, and proposes a functional vision checklist that may be used by teachers or paraprofessionals to gain insight into how a child is using his residual vision.

FORMAL ASSESSMENT OF VISUAL ACUITY

The problems inherent in determining visual acuity of multiply handicapped children have been stated by Allen (1957), Wolfe and Harvey (1959), Hoyt (1963), Sloan and Savitz (1963), Ffooks (1965), Borg and Sundmark (1967), Faye (1968), Lippman (1969), Macht (1971), and Sheridan (1973). Under the conditions imposed by the instruments used for testing visual acuity, low functioning children are easily distracted, lose interest in the test, fear the testing situation, fail to understand the tests, and give unreliable and inconsistent responses. Special educators and ophthalmologists have tried to find visual acuity tests that are effective with severely handicapped children, since visual impairment is frequently found with other handicapping conditions. Blackhurst and Radke (1968) found that moderately retarded children had four times as many visual impairments as the normal school population; Vernon (1969) reported that approximately 25 percent of deaf children had some form of visual impairment, and Wolf and Anderson (1973) provided evidence of visual limitations in 50 percent of cerebral palsied children.

What is Visual Acuity?

Wolfe and Harvey (1959) defined visual acuity as the ability to distinguish small spatial separations, or intervals, between portions of the visual field. Since it depends upon the ability of the eye to resolve a given visual angle, acuity is greater the closer together are two points that can be distinguished. Wolfe and Harvey distinguished sensory from visual acuity as an individual's reaction to low-keyed sensory data of mild duration and extent. Lippman (1969) suggested that sensory impressions developmentally advance from discriminative and perceptual stages to a conceptual stage.

Sheridan (1970) segmented acuity into two separate processes which are particularly relevant to multiply handicapped children: *seeing* and *looking*. Described as a physiological process dependent upon intact visual mechanisms, *seeing* is "the reception of mobile and static patterns of light, shade, and hue by the eye and transmission of this information to the central nervous system" (Sheridan, 1973). Primarily a psychological process, *looking* combines perceptual id conceptual operations to attend to visual stimuli with urposeful interpretation of their meaning.

As the child's awareness of his world increases so does his bility to distinguish visually and to respond to more abstract orms of stimuli through gradual refinement of his acuity to s mature state. Sheridan (1973) believes that by 12 months child has a visual acuity comparable to adult vision, lthough it is not efficiently developed. A child of kindergar-n age should be able to attend to an object for at least 20 econds, pursue a moving target in all directions with a inimum of head movement, and localize different visual imuli within the environment (Banus, 1971).

The majority of multiply handicapped children with sig-ificant visual deficiencies retain some functional vision and o see. However, their limited experiential and cognitive pertoires—essential to the integration of sensation into eaningful stimuli—prevent them from looking.

ORMAL TESTS ND PROCEDURES The formal tests that offer the most promising information about the ex-nt of visual functioning of multiply handicapped children re Sheridan's Stycar Vision Tests and Koehler's New York lashcard Vision Test (Faye, 1968). These tests were de-eloped specifically for use with handicapped children and assess near as well as distant vision.

Lippman (1969) found the Stycar to be the most reliable est in screening visual acuity of preschool children. Al-hough Sheridan devised a distant screening chart consisting f only nine capital block letters chosen on the basis of imple vertical and horizontal lines (L H T), the circle (O), he cross (X), the part-square (U), the triangle (A), and the art-triangle (V), her Miniature Toys Test and Rolling Balls est (subtests in the Stycar battery) are in fact more useful n evaluating vision in multiply handicapped children.

The Miniature Toys Test was developed for use with everely handicapped children who were unable either to atch letters or name and match colored pictures of common bjects placed individually on cards. After experimenting ith numerous toys, Sheridan found the most effective ones be a car, plane, doll, chair, knife, fork, and spoon, all 2″ igh; a larger knife and spoon 3¼″ high; and a doll 5″ high. he found that children as young as 21 months successfully atched the objects and that their interest in the task lasted r its duration.

Designed paticularly for use with children from six to 30 onths, the Rolling Balls Test consists of a series of graded alls projected a distance of 20 feet. The child is required to etrieve them one by one after they have been rolled horizon-lly across his line of vision.

The New York Flashcard Vision Test was developed out of need for assessing the visual acuity of multiply handicap-ed children, visually handicapped preschool children, and he nonreader of any age (Faye, 1968). Only three symbols eart, house, and umbrella) make up the test. They are resented one at a time on 12 reversible 4″ x 5″ flashcards nellen acuity notation is printed on every card, three ymbols for each acuity level from "200" characters to "10." s long as they are consistent, children may verbally or anually label symbols anything they like or, if unable to xpress themselves, can point to large matching symbols. verage children of 27 months consistently attended and esponded appropriately to the three symbols, and Faye uccessfully screened trainable mentally retarded children ith the cards. The test is administered to the conventional ethod of acuity testing, except that the test distance is ten feet or less and notations can be converted to the 20-foot reading.

Unsuitable Tests

Other formal measures of visual acuity have required skills not in the repertoire of multiply handicapped children. Sloan and Savitz (1963) identified two major forms of visual acuity tests, those based on indicating directions and those requiring identification of pictures.

In reviewing tests based on indicating directions, Sheridan (1973) felt that the Snellen E, the Sjorgen-Hand Test, and Landolt's Broken Rings included three major factors that significantly influenced the low functioning child's ability to perform adequately on them. Because multiply handicapped, as well as preschool children, have difficulty in coping with diagonals, they responded only to figures pointing up, down, left, or right. Directionality also complicates the assessment of multiply handicapped children as they confuse left and right and, although they may perceive laterality, they experience confusion in duplicating the position of the symbols. Because the patterns presented are constant, no opportunity is available to observe the child's ability to discriminate differences in configuration (Sheridan, 1973 and Ffooks, 1965).

Picture identification tests have been most frequently employed in testing handicapped populations though numerous adapted procedures have been necessary. Osterberg (1965) specified three requirements to bear in mind in the selection and development of pictorial visual acuity charts: 1) optometric principles must be adhered to as closely as possible; 2) objects must belong to the child's world of ideas; and 3) presentations of pictures must be adapted to the child's demands for recognition of pictures greatly variant from adults' needs. Other authors (Allen, 1957; Wolfe & Harvey, 1959; Hoyt, 1963; Faye, 1968; and Sheridan, 1973) have stressed the importance of using pictures of objects within the child's experiential repertoire. General criticisms of picture charts were that the pictures inaccurately projected angles at a nodal point corresponding to the highly accepted Snellen E symbol and required personal experience and ability to recall labels. More specific concerns have been expressed by Sloan and Savitz (1963), Borg and Sundmark (1967), and Ffooks (1965). Sloan and Savitz (1963) and Ffooks (1965) stated that picture tests were too dependent on psychological interpretations of figures before they could be understood and recognized by children.

INFORMAL TESTING OF VISUAL ACUITY Adaptations of formal tests have included deleting items; projecting them onto large screens; manipulating three dimensional response materials; converting response forms into puzzles; altering the type of figure, outline, silhouette, background, or color of the target and response figure; and applying operant technology (Courtney & Heath, 1971 and Macht, 1971). Although numerous tests have been developed and adapted with handicapped children in mind, none have proved satisfactory for use with this population unless administered through some form of operant procedure.

Employing an operant approach, Courtney and Heath (1971) examined and evaluated the color vision [illegible] [illegible] trainable mentally retarded children using the AO HRR Color Vision Tester to determine the percentage of color blindness among the population of mentally retarded individuals. They found the AO HRR effective, as it offered four training and six testing plates graded for both type and severity of color blindness. The test proved to be highly motivating, required no verbal responses, no ability to read conventional numbers, and no need for the coordination essential for tracing paths. Training the children to take the color form of the test was accomplished through a black and white adaptation of the colored symbols O, X, and Δ. Identical forms were painted on slabs hinged to a box which dispensed M & M's whenever a correct response was given. Most children required about five minutes of training, but the authors succeeded in testing one 12-year-old Mongoloid child with an IQ of 35 after 40 minutes of training. No difference was found in the prevalence of color blindness among mentally retarded individuals and that of normal individuals reported in the literature.

Macht (1971) applied operant technology to obtain a subjective measure of visual acuity in five mentally retarded children between five and seven years of age. He included in his subject population two adults of normal intellectual and visual functioning to verify his results. Through the use of a specially constructed wheel displaying two stimulus Snellen Illiterate E's, one at the top and the other at the bottom of the wheel, and a table containing a response mechanism, Macht not only devised a way to evoke responses to the Snellen Illiterate E Chart, but also included an elaborate training system. The children were placed at the table 20 feet from the wheel and were trained to respond by pushing the response lever to the upright E, as opposed to the E which inverted as the wheel turned. Subjects were reinforced with M & M's and small candies for appropriate responses. The initial training E was larger than the 20/200, but for the actual testing the 20/200, 20/100, 20/70, 20/50, 20/40, 20/30, and 20/20 E's were utilized. Obtaining significant successful results that correlated with the adults' responses, Macht attributed children's previous failures to respond to the Snellen E and other visual acuity tests to procedural inadequacies rather than to the presence or absence of some quality in the child himself.

Macht and Courtney, with their promising results, offered the field of visual assessment valuable implications for successful application of tests that had previously proved ineffective with multiply handicapped children. Teachers cognizant of how children functionally use their vision can give ophthalmologists information that is helpful in determining visual capacities. Assessing functional vision in the severely handicapped child is a first step in planning educational programs relevant to his needs.

Informal Teacher-Oriented Visual Screening

Informal teacher-oriented visual screening procedures can effectively obtain important, practical information regarding what a child sees and how well he sees it. Although informal, the evaluation should be carried out systematically. Establishing a working rapport with the child, the setting, and stimulus materials is of primary importance. With a particularly young child, it may be necessary to hold and rock or sing to him for several minutes to quiet him. Sharing a manipulative toy often helps the evaluator to gain the confidence of an older child. The setting should be small, uncluttered, and quiet. Working with the child on the floor, where the evaluator has easy access to both the child and materials, facilitates administration of stimulus materials, puts the child and evaluator on the same level, and prevents attempts to leave a table, slip from a chair, or push materials from the table. Multiply handicapped children are more responsive to highly motivating materials, although in this assessment they must be limited in sound components to insure that the child is attending visually rather than aurally.

Suggested materials for eliciting visual behaviors outlined in the assessment are brightly colored soft rubber squeak toys (with the squeaker removed this toy can be squeezed to produce action but the sound is eliminated), a penlight or small flashlight, fluorescent rubber toys containing lights, and mechanical toys having flints producing sparks when operated. Especially motivating for severely handicapped children are rattles encasing moving parts; large and small spinning tops and easily rolled cars; fluorescently colored inch cubed blocks; small candies or cereals such as M & M's, Fruit Loops, cake decorating items; and roly poly action toys. Other suggested materials are a small box, paper and brightly colored magic markers; plastic pegs and board; brightly colored, textured books with thick pages; large beads; stacking cones; a primary puzzle with approximately three pieces; multicolored counting bears; shape sorting chips or parquetry blocks; simple pictures in duplicate glued to small index cards; or commercially produced pictures and duplicates of different colored toys for matching.

The first stage of the visual assessment should be to observe the child for immediately obvious visual abnormalities and behaviors indicating deficient vision. Primary questions to be answered should focus on the presence or absence of basic visual responses and the types of visual stimuli (light, movement, color) to which the child attends. Observing not only the manner and direction in which the child reacts to visual stimuli, but also the distance and size of objects eliciting the most consistent response, provides insight into the positioning of specific materials useful in obtaining maximum visual attention. Equally important is the assessment of the child's ability to integrate visual stimuli with cognitive and motor processing skills to perform discrimination, association, figure-ground, and eye-hand coordination activities. Simple techniques for use in assessing five aspects of visual function are given below. Figures I through V suggest check lists a teacher may use for recording information about a multiply handicapped child's performance.

Techniques for Functional Vision Screening

I. Presence and Nature of the Visual Response

a. Direct a penlight into the child's eyes from 12" away and observe whether the pupils constrict, then dilate when the light is removed. Be sure to observe his eyes before shining the light as blind children often exhibit hippus, a continual constricting and dilating of the pupil.

b. Assessing a tendency of the eyes to deviate can be done by flashing a beam from a penlight into the child's eyes from 30" away. If the light is reflected simultaneously in the middle of each pupil, no deviation is present. If the reflection is centered on one pupil but off-center in the other some form of muscle imbalance is indicated.

c. Place the child on his back and kneel behind his head. Pass your hand across his eyes, pause and repeat. A blinking reflex indicates some light perception and possibly some object perception.

I. Presence and Nature of the Visual Response

a. Pupillary reaction: ___present ___absent ___R ___L
b. Muscle imbalance: ___present ___absent ___R ___L
c. Blink reflex: ___present ___absent ___R ___L
d. Visual field loss: ___present ___absent ___R ___L
e. Peripheral field loss: ___present ___absent ___R ___L
f. Visual field preference: ___present ___absent ___R ___L
g. Eye preference: ___present ___absent ___R ___L

II. Reaction to Visual Stimuli

a. Inappropriate visual behaviors: ___present ___absent
b. Tracking ability: ___present ___absent
  ___light ___objects: ___vertical ___circular
  ___horizontal ___oblique
c. Reaches for toys: ___present ___absent
  ___in front of him ___to his right ___to his left
  ___above eye level ___below eye level
d. Shifts attention: ___present ___absent
  ___both sides ___one side ___R ___L
e. Scanning ability: ___present ___absent

III. Distance and Size of Objects and Pictures

a. Locates dropped toy: ___present ___absent ___distance
  ___peg or candy ___inch cubed blocks ___shape chips
b. Small toy observed: ___present ___absent ___distance
c. Large toy observed: ___present ___absent ___distance
d. Objects matched: ___present ___absent ___distance
  large toys ___distance
  small toys ___distance

IV. Integration of Visual and Cognitive Processing

a. Visual pursuit: ___present ___absent
b. Causality: ___present ___absent
c. Object permanence: ___present ___absent
d. Object concept: ___present ___absent
e. Means-ends: ___present ___absent

V. Integration of Visual and Motor Processing

a. Approach:
  1. pegs: ___visual ___tactual Reach: ___O ___U
  2. stacking cone: ___visual ___tactual Reach: ___O ___U
  3. puzzles: ___visual ___tactual Reach: ___O ___U
  4. pounding bench: ___visual ___tactual Reach: ___O ___U
  5. beads: ___visual ___tactual Reach: ___O ___U
b. Matching:
  1. colored blocks:
    ___matches ___does not match ___near distance ___far distance
  2. shapes:
    ___matches ___does not match ___near distance ___far distance
  3. pictures:
    ___matches ___does not match ___near distance ___far distance

d. Assess the child's perception of light using a penlight. From 12" or closer flash the light and note whether he attends to it. The light should be flashed slightly above, below, to the left, and right of the child's face to determine the range of visual field. Note whether he fails to attend to the light in any plane.

e. Sitting behind the child, bring the light slowly into his right, then his left visual field. Note at which point he turns to look at the light. He should notice it when it is directly in line with the lateral portion of the eye.

f. Present the child with play objects of equal interest simultaneously in the right and left visual fields and gesture for him to touch them, switch their positions and repeat. Observe whether the child attends to a toy in only one position rather than both.

g. While holding a motivating toy 12" to 18" in front of the child's eyes, alternately cover each eye. Observe whether he resists having one or both eyes covered or if he remains indifferent to the covering. Children having limited or no vision in an eye will not mind having that eye covered but will strongly resist covering of the functional eye.

II. Reaction to Visual Stimuli

a. Observe the child for any inappropriate visual behaviors such as light flicking with fingers or objects or eye poking.

b. Evaluate the child's ability to localize, track, and scan by holding puppets, small squeeze toys, or penlights within the child's range of vision. Move them slowly from left to right, up and down, and in oblique angles. Note whether he locates an object efficiently and attends for at least 20 seconds.

c. Place toys at all levels and in all directions and watch to see if he turns and reaches for them. These items should be interspersed throughout the evaluation to maintain interest in looking.

d. Note whether the child is able to shift his attention by holding two toys of equal interest approximately one foot apart in front of the child. Shake one, pause, then shake the other. Observe whether he shifts his gaze to the other toy.

e. Observe his ability to scan by placing three objects in front of him and watch to see if he shifts his attention from one toy to the next in line.

III. Distance and Size of Objects and Pictures

a. While interacting with the child, scatter small pegs or candies ¼" in diameter, inch cubed blocks, counting bears, or shape chips around the child and encourage him to find them. Note the distance at which he most consistently attends to the various sized objects.

b. Project large (6" to 8" in diameter) and small (2" to 3" in diameter) toys to the left, right, and forward from the child and observe how far they travel before he [illegible] ceases in his efforts to retrieve them.

c. Using a set of toys in duplicate, except for color, those used in B, have the child match his objects with yours as you display them singly. Begin at 10 feet for large and 5 feet for small objects. Obtain the maximum distance at which the child sees the objects without straining by moving backwards or forwards in 2-foot intervals until he consistently matches four or five objects.

IV. Integration of Visual and Cognitive Processing

a. Tap or pour blocks and pellets from containers in front of the child. Note whether he looks at them as they tumble before him.

b. Scribble large circular motions with magic marker on white paper in front of the child. Note whether he watches or attempts to take the marker.

c. Give the child M & M's to hold, help him place them in a small box and shake them around. Take the box from the child and quickly remove the candies. Watch to see if he looks for the candies when you return the box.

d. Give him a large colorful book to look at. Note whether he bends to look at the pictures or pats them.

e. Give the child a toy which has continuous action and attracts his attention. As he watches, push the toy out of his sight and note if he looks for the toy. Replace it before him without the motion and observe whether he attempts to reactivate it.

V. Integration of Visual and Motor Processing

a. On activities involving the pegs, stacking cone, puzzles, pounding bench, and beads, watch to see if he directly inserts or applies pieces, overreaches (O), or underreaches (U). Does he look for the recess and the hole or does he only tactually approach them?

b. When shown one colored block, shape, or 2″ picture at a time, can he match it, given only two choices? Watch to see which colors, shapes, and pictures he matches and if he attends to color or configuration. Observe the distance from the materials at which he works, then have him match them at a far distance. Note the farthest distance at which he correctly matches each.

Summary

Traditional tests of visual functioning and acuity have lacked the impetus essential for assessing children with multiple impairments. Although operant measures have been successful in eliciting behaviors required to respond to these tests, Sheridan and Koehler have offered the most promising formal tests for this population. Until the use of the New York Flashcard Vision Test and the Stycar Vision Test is more widespread, the task of visual assessment remains primarily with the teacher. Obtaining even a gross indication of the child's functional visual field—a preferred eye, distance at which he most efficiently works with various sized objects, and the level of complexity of the visual stimuli that the child successfully interprets—provides the teacher with basic information needed to design an educational program relevant to the child's visual and developmental needs. ■

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FUNCTIONAL VISUAL EVALUATION

(Adapted from Langley & L[illegible]ose's evaluation form)

ITEM	DATE	PRESENT/P ABSENT/A	LEFT OS RIGHT OD BOTH OU	DISTANCE OF LIGHTS &/OR OBJECTS	ILLUMINATION	TYPE & SIZE OF LIGHT &/OR OBJECT	INDEPENDENT/ DEPENDENT DESCRIPTION
Pupillary reaction							
Muscle Imbalance							
Blink reflex							
Visual field loss lights/objects							
Peripheral field loss lights/objects							
Visual field preference lights/objects							
Eye Preference lights/objects							
Different Visual behaviors (ie. flicking, poking, gazing)							

ITEM		PRESENT/P ABSENT/A	RIGHT OD LEFT OS BOTH OU	DISTANCE OF LIGHT &/OR OBJECTS	ILLUMINATION	TYPE & SIZE OF LIGHT &/OR OBJECT	INDEPENDENT/ DEPENDENT DESCRIPTION
Tracking ability lights/ objects							Horizontal, verticle,oblique circular:
Reaching for Lights/ objects a. maximum distance b. minimum size							Infront, to right,to left, above eye level, below eye level:
Shifts attention lights/ objects			Both side: right: left:				
Scanning ability lights/ objects							
Approach: a. large objects b. small objects							Visual/tactual/ other senses
Matching: a. large objects b. small objects c. shapes d. (Peabody)pictures							

ITEM	DATE	PRESENT/P ABSENT/A	LEFT OS RIGHT OD BOTH OU	DISTANCE OF LIGHT &/OR OBJECTS	ILLUMINATION	TYPE & SIZE OF LIGHT &/OR OBJECT	INDEPENDENT/ DEPENDENT DESCRIPTION
Ability to follow moving objects							
Causality							
Object permanence							
Object concept							
Means-Ends							

Adaptation of "Functional Vision Screening for Severely Handicapped Children"

by Beth Langley & Rebecca DuBose

*General Comment: There is not enough opportunity for description throughout the screening (ie: what happens, behaviorally, when there is a negative or positive response?, what are the illumination conditions?, what is the size and distance of light and object?). See "Functional Visual Evaluation,"an adapted screening form

I. Presence and nature of the visual response.

1. Direct a penlight into child's eyes from 12" away. Observe whether the pupil constricts or dilates. Take note of "hippus", continual constriction and dilation of pupil.

ADAPTATIONS: a. observe for fixed pupil

b. observe pupil after child emerges from a period of time in a dark room.

c. use an "optistick" (milimeter ruler to measure pupil size)

If pupil doesn't seem to move, is child perceiving light? What does no pupillary response, mean?

2. Tendency for eyes to deviate - muscle imbalance. Shine a penlight into child's eyes from 30" away, note if light is reflected in the middle of each pupil. What happens if child has aniridia?, leukokonia?

3. Blink reflex - while child is on back, pass hand over child's face.

ADAPTATION: a. wind created by passing hand, can cause child to blink

b. move hands towards child's face with fingers open.

4. Perception of light - with penlight from 12" or closer, flash light, note whether child attends to it. Shine it slightly above, below to left, to right.

5. Sitting behind child, bring light slowly into right, then left visual field. Note at which point child turns to look at light. Child should notice it when it is directly in line with lateral portion of the eye.

ADAPTATION: a. important for teacher to maintain a consistent arc in presenting the light.

b. possible for child to see beyond lateral portion of the eye, closer to the ear.

c. movement speed of the light should vary from child to child.

6. Visual field preference - present child with objects of equal interest simultaneously in right and left visual field. Gesture for him to touch them. Switch and repeat. Observe whether child attends to toy in one position rather than both.

ADAPTATION: a. why is there a sudden shift from lights to objects? Actually, all items following should be administered with lights and objects and descriptions of each should be recorded.

b. Many times severely impaired children don't have interest or motivation to observe any objects or lights.

c. Is the child preferring the toy or the field if they seem to attend in one position.

d. Is the child ignoring one field, rather than not seeing it?

7. Eye Preference - while holding a toy 12 to 18" in front of child's eyes, alternately cover each eye and observe any behavioral reaction. Children having limited vision in one eye resist having their good eye patched.

ADAPTATION: a. Tactually defensive children will not allow either eye to be patched:

b. Many severely impaired children don't seem to react to anything.

c. If child doesn't resist does it mean they are preferring an eye?

II. Reaction to visual stimulus

1. observe child for any inappropriate visual behaviors (ie. light flicking with fingers or objects or eye poking).

ADAPTATION: a. with those children who seem not to react to anything, light flicking, light gazing and eye poking are the only indications that there may be vision. Therefore, the word "inappropriate" is inappropriate.

2. Tracking ability - evaluate child's ability to localize, track and scan by holding puppets, small squeeze toys or penlights within child's range of vision. Move slowly left to right, up and down and circularly. Note whether he locates object efficiently and attends for at least 20 seconds.

a. Activity should be done in child's range of vision but also in other fields - possibility of stimulating other functional fields.

b. 20 seconds might be an unrealistic expectation from a severely impaired individual - attention time is individual.

3. Reaches for toys - Place toys at all levels and in all directions and watch to see if he turns and reaches for them. Items should be interspersed throughout evaluation to maintain interest in looking.

4. Shifts attention - Note whether child is able to shift attention by holding two toys of equal interest approximately one foot apart in front of child. Shake one, pause, shake the other, observe whether attention is shifted.

ADAPTATION:

a. position of presention of toys may be out of child's functional fields

b. hard to find objects of any interest with severely impaired children

c. child can be ignoring or have muscle problems-in eyes, neck.

d. child may or may not be auditorily or visually stimulated by shaken toy - blind lights

5. Scanning ability - observe ability to scan by placing three objects in front of him and watch to see if he shifts attention from one toy to another in line.

ADAPTATION:

a. Infront may not be in field

b. child may not be motivated to look

*Sections II, IV and V should be combined for the following reasons:

1. Size and distance measurements are inclusive in most sections and not isolated to these last three.
2. Integration of visual and cognitive as well as visual and motor processing is inclusive in all visual behavior and should not be considered isolated.

ADAPTATION:

1. Approach - on activities involving pegs, stacking cones, puzzles, pounding benches, brads, etc., watch to see if child directly inserts or applies pieces. Overreaches or underreaches. Does child look for recess and hole or only tactually approach them.
2. When shown one colored block, shape, or 2" picture at a time can he match it given only two choices? Watch to see which color, shapes and pictures child matches and if attention is to color or configuration. Observe distance at which child works, then have child match at far distance. Note farthest distance child can correctly match each.

ADAPTATION:

   a. high functioning activities for severely impaired children.
   b. use a variety of sizes and colors
   c. note whether child is using any other senses during exploration.
   d. match large and small objects, use peabody pictures.

3. Visual persuit - Tap or pour blocks and pellets from containers in front of child, note whether whild looks at them as they tumble before him.

ADAPTATION:

a. definition of visual pursuit - ability to follow moving objects with eyes only, not what's being tested here. Should be called "ability to follow moving objects".

b. If you drop pellets or blocks, there is an auditory cue.

c. Use colored water, sand, slinkys, balls.

4. Causality - scribble large circular motions with magic marker on white paper in front of child, note whether child watches or attempts to take marker.

ADAPTATION:

a. questionable relevance for severely impaired child

b. child may not give any attention

c. black on white may not be most effective contrast

5. Object Permanence - give child M&Ms to hold, help place in small box and shake them. Take box from child and quickly remove candies, watch to see if child looks for candies when you return box.

ADAPTATION:

a. food may not be appropriate teaching tools.

6. Object concept - give large colorful book to look at. Note whether he bends to look at them or pats pictures

ADAPTATION:

a. not clear what is being tested

b. might be appropriate to pat pictures

c. use peabody pictures - can't relate to pictures in a book.

7. Means - ends - give child toy which has continuous action and attracts attention. As child watches, push toy out of sight and note if child looks for toy. Replace it before child without motion and observe whether child attempts to react to it.

ADAPTATION:

a. Severely impaired child may not attend or be physically able to move

b. Most common action toys make noise

REFERRAL REPORT

(Attach copy of Medical Eye Report)

NAME: MEDICATIONS:

BIRTHDATE:

GRADE: OTHER IMPAIRMENTS:

Student understands his/her visual impairment YES NO UNSURE

Explain:

Student's Visual Needs:

A.

B.

C.

D.

FUNCTIONAL VISION

In all catagories note factors such as lighting conditions, distance and size of objects, etc. Use specific examples to illustrate the student's strengths and weaknesses.

Visual Posture/Behaviors
(e.g, tactual/visual approach, light flicking/gazing, body symmetry, head posture, preferred eye, eccentric fixation/viewing, squinting,etc.)

Near Vision (Face to 16"/40cm.)
(e.g, awareness of lights/objects tracking of lights/objects, eye-hand coordination, preferred working distance for play, reading, writing activities, etc.)

Referral Report

Intermediate Vision (16"/40cm--arm's length)
(e.g, awareness of lights/objects reaching objects, reading music, typing, workshop activities, etc.)

Distance Vision (Beyond arm's length)

Indoor (e.g, ability to detect facial details, reading chalkboard, watching T.V. and movies, object detection/avoidance, etc.)

Distance Vision

Outdoor (e.g, sees traffic lights, sees and/or reads street and store signs, bus numbers, object detection/avoidance, etc.)

Visual Fields
(e.g, bumping into/tripping over objects, undectected objects, shuffling feet, misjudging distances at steps, curbs, etc. Note location, size and height of objects bumped into, tripped over or undetected.)

Referral Report

Travel Ability

(Note level of dependent/independent functioning in both familiar and unfamiliar environments, use or non-use of travel aids, etc.)

Illumination/Glare

(Note preferred illumination, glare recovery and dark adaptation times, night vision, etc.)

Questions and Additional Comments:

VALUATOR ______________________________ JOB TITLE ______________________________

DATE: ________________________

Instruction for Completion of Referral Report to Examiners

Check student's medical files for information on medications the child is taking as certain medications produce ocular side effects. If the child is under medication which causes behavior changes or affects his/her normal level of functioning, indicate this to the doctor at the time of the exam.

List additional impairments and explain to doctor any impairment which may hinder or prevent the child from responding to certain instructions or tasks the doctor may require of the child. Inform the doctor about behaviors such as tactual defensiveness before the child is examined.

Student understands his/her visual impairment

If applicable, explain whether or not the student knows the origin and condition of his/her visual impairment and what the student understands about the functional implications of the visual loss.

Student's Visual Needs

In this section identify need areas such as increased working distance and/or print size, reading chalkboard, identifying bus numbers, protection from glare, ocular health, etc. If applicable, student should be questioned and asked to identify his/her visual need and desires.

Visual Postures/Behaviors

To complete this section observe the child in a variety of settings and working distances. What is child's appearance? Does he/she demonstrate squinting behavior, facial straining, head tilt or different visual behaviors such as light flickering or gazing? Does the child prefer one eye over the other? Does the child maintain eye contact or need to turn his/her head or eye away from an object to view eccentrically? In general, does the child perform most tasks visually or tactually? Is groping behavior observed or does the child travel and work visually? If the child exhibits no visual behavior, indicate that the child appears to be functioning as totally blind. In this section comment on external appearances, such as redness, or swelling of the eye.

Near Vision

In this section comment on the child's visual behavior at near range. Tasks that the child performs from as close as his/her face to 40 cm. should be covered. If the child is not performing at higher levels of visual perception, describe the child's ability to detect and track various light sources. Is tracking smooth or jerky and is child using one or both eyes? If the child can discriminate objects, how close does he/she prefer to hold them and with which eye does the child view objects at close range? Note here what size print the child reads and under what conditions of illumination the child normally works. State any difficulty with eye-hand coordination and specific problems encountered in reading or writing. Note at what, if any, near point the child is unable to distinguish detail. Any visual problem you observe the child to be experiencing at near range should be noted, along with a description of the child's behavior.

Intermediate Vision

Comment on child's visual functioning for tasks ranging from 16"/40cm to arm's length. Note whether child has the ability to distinguish details at this range or whether all visual functioning is only at near range. Does child passpoint or reach short of objects? Can child hold objects or read print at this distance without squinting or moving forward? Can student read his/her music, type or perform workshop activities requiring this distance without difficulty? If student is performing at lower levels of visual functioning such as only awareness of and/or tracking of lights or objects, does tracking behavior continue if lights or objects are moved out to this distance?

Distance Vision - Indoor

In this section comment on child's ability to perform tasks such as reading the chalkboard, viewing T.V. or any activity which is usually performed beyond arm's length. When the child moves around in the classroom or in familiar or unfamiliar buildings can they distinguish objects at a distance and avoid bumping into them? Is there a difference between the student's ability to detect and avoid objects in an unfamiliar as opposed to a familiar setting? Does the child have difficulty distinguishing facial details beyond arm's length or can he/she recognize faces at this distance.

Distance Vision - Outdoor

Comment on child's ability to read street signs, house numbers and store signs at a distance beyond arm's length. If child can see and/or read these signs comment at what distance the child must stand to be able to do these activities. Note type of day such as cloudy or sunny and whether child's performance differs if he/she is facing towards or away from the sun. Can the child distinguish traffic lights from his/her side of the intersection as well as from across the street? When traveling outdoors can objects and people be detected from a distance and be avoided? At what distance do details began to blur out on the child?

Visual Fields

What, if any, areas of the child's visual fields seem to present the child with any difficulty? Does child only trip over or bump into low lying objects, indicating a possible inferior field loss, or does child bump into objects that are higher in his/her visual field? If student does bump into objects, are they located on his/her right or left side. Is this behavior consistent or inconsistent? Does the child shuffle his/her feet at stairs and curbs and appear to misjudge distances and take false steps? Does child seem to consistently detect objects presented from different sides or must evaluator call child's attention to objects at different positions in relationship to the child? Does the child consistently turn his head to the side to view or make direct eye contact with his/her materials?

Travel Ability

Is the child an independent visual traveler or must the child rely on a sighted guide, cane or dog to assist in traveling? Is the child's level of travel ability different in an unfamiliar area as opposed to a familiar environment? Does the child rely on tactual or visual methods to travel? Does travel ability differ indoors as opposed to outdoors? Include comments on travel abilities in different lighting and weather conditions.

Illumination/Glare

Under what type of illumination does the child prefer to work? Does this vary according to distance? Does any illumination adversely affect the child's performance? Comment on how long it takes the child to adjust when moving from bring to dim lighting conditions and vice versa. Does the sun bother the student and cause him/her to shade his/her eyes? Does the child wear sunlenses outdoors? Comment on whether child's level of visual functioning decreases at night.

Questions and Additional Comments:

Use this section to indicate your priority areas in the evaluation. Note specifically what questions you wish the doctor to answer in regards to the child's visual performance in the classroom, at home or in travel situations. Any areas in the report on which you wish to further expand your explanations and comments should be written here. These questions can then be covered by the doctor at the time of completion of the child's examination.

SECTION III

Treatment Options

This section will involve a description of the categories of aids that are available for the low vision child. Emphasis will be placed on the advantages, disadvantages and important characteristics necessary for appropriate use of the aids. Various types of magnification and implications for classroom and mobility use will also be discussed.

I. Types of magnification
II. Contact lenses/fresnel
III. Spectacle microscopes
IV. Magnifiers
V. Telemicroscopes/telescopes
VI. Characteristics of common optical aids

TYPES OF MAGNIFICATION

The purpose of magnification, regardless of the method of obtaining it, is to increase the size of the retinal image. For purposes of low vision management, there are basically four ways in which magnification at the eye may be increased. They are:

Relative size magnification
Angular magnification
Relative distance magnification
Projection magnification

1. Relative size magnification is that magnification brought about by increasing the actual size of the true object. This can be done with many kinds of objects such as large print books, large eyed needles, large T.V. screens, etc.

Disadvantages:

a. Few books are available in large print and the attempt to print a large selection would be prohibitive.

b. Large print obviously results in both larger and thicker books and papers.

c. Some partially sighted patients may resist learning to use other types of magnifying devices after becoming accustomed to large print.

Advantages:

a. Large print books permit unrestricted fields of view and allow more normal working distances than most optical aids.

b. Large print is advantageous in beginning reading training or training with low vision aids. It is best to have as few factors as possible.

2. Angular magnification is the ratio of the apparent size of the object as seen through the instrument compared to the true size of the object. An example of angular magnification can be seen with a telescope.
   Therefore, when we say a telescope has 3x magnification, we mean the apparent size is 3 times larger than the actual size.
3. Relative distance magnification is that magnification which results from reducing the distance between the object and the eye. This magnification is used when we talk about near reading distances. When we move a constant sized object from 40cm. into 5cm. we are getting 8x magnification since we are moving it 8 times closer. The purpose of high plus spectacles for near magnification is to allow the patient, who otherwise has insuffcent accommodative facility, (focusing ability) to focus the object clearly at a very short distance.
4. Projection magnification may be defined as that magnification which results when an enlarged image of an opaque or transparent object is produced on a screen. The basic magnification obtained with these systems is produced electronically rather than optically. An example of this can be seen as the closed circuit T.V. These instruments have a lot of advantages:
   a) you could get a tremendous amount of magnification binocularly,
   b) able to increase or decrease image brightness,
   c) able to increase or decrease contrast,

    - d. Control background illumination by changing black on white to white on black.

2. Obvious disadvantages:
    - a. Equipment generally not portable,
    - b. Relatively expensive.

Contact Lenses:

Contact lenses have been found useful and effective in prescribing for:

1. Keratoconus,
2. High, irregular astigmatic error and corneal irregularities,
3. High myopia,
4. Monocular or binocular aphakes
5. Albinos,
6. Aniridia

Fresnel Lens:

A fresnel lens is a lens whose surface is made up of a series of stepped concentric zones, which allows powers in larger diameters without requiring the incumbent thickness of continuous surface type lenses. Available in powers from +20.00 D to -20.00D. (also available in prism up to 30Δ)

Spectacle Microscopes:

Microscopes are high powered plus dioptric lenses worn as a reading spectacles. The magnification obtained through a microscope results from relative distance magnification. As the power of the lens increases, the cylinder becomes less significant factor in total lens power. Cylinders may not be needed when reading at close distances.

1. Factors that require consideration with microscopes:
    - a. correction of aberrations
    - b. close working distances
    - c. the need for good lighting
    - d. field of view
    - e. thickness and weight of lenses
    - f. amount of convergence required for binocular vision
2. Other characteristics of microscopic lenses:
    - a. both hands are free to hold reading material
    - b. spectacle lenses have the largest reading field of any optical aid.

c. microscopic spectacles are available in many different forms - (Best reference would be the book - Low Vision Care by Mehr and Freid, page 179-201)

d. The doctor has to remember to account for patient's refractive error when prescribing full field microscopes.

e. Keep spectacles as close to eye as possible to get maximum field

f. Cut the power of the microscope and increase the size of the reading material when the patient exhibits difficulty with the working distance.

MAGNIFIERS:

A. Handheld Magnifiers:

   1. Most accessible aid
   2. Used for short-term tasks
   3. Use as second Rx in many instances
   4. Use as a training aid for microscopes (close working distance problems)
   5. They are excellent aids for classroom use.

B. Optics of Handheld Magnifiers

   1. When used at the focal distance magnification does not vary with distance.
   2. Working distances will vary when material is held inside the focal length
   3. Refractive errors can be determined by observing working distances

C. Stand Magnifiers

   1. Used when patient rejects close working distance of microscope and tremors prevent use of handheld device
   2. Used for short-term tasks generally
   3. Excellent as a second Rx
   4. Stand magnifiers are accepted by children more readily than microscopes.

D. Optics of Stand Magnifiers

   1. Most complicated optical system:

      $\text{Mag} = Pm + A - h^{P}mA$

   2. Magnification less than that marked on device. (Read complete specifications in Sloan's text)
   3. Presbyopic patients must accommodate

TELESCOPES:

A. Handheld telescopes routinely used in the low vision clinic range in powers from 2.5x to 10x. These are used for spotting purposes or short-term tasks.

    1. Non-focusable units are best used at distances greater than 12 feet.
    2. Focusable telescopes must be focused for a patient first. Most telescopes won't focus clearly inside 6 feet. Check your unit for each patient.
    3. Refractive errors can be picked up by observing position which patient focuses unit.

B. Fullfield Spectacles Telescopes are used only for those tasks which require the largest telescopic field possible and where mobility is not a factor.

    1. Units are non-focusable but can be ordered for 20 feet or infinity. (Keeler has a focusable unit)
    2. Refractive errors are incorporated in the ocular portion of the telescope.
    3. The refraction should be performed behind the telescope when considering a telescopic Rx.
    4. A sophisticated Rx is available from Designs for Vision and Keeler. Simpler devices can be designed with sportglasses, etc. utilizing fresnel lenses and/or contact lenses when a refractive error correction is needed and finances are limited.
    5. Powers are available in 1.3x to 6.0x.

C. Bioptic Telescopes are used when telescopic magnification is needed and mobility is required.

1. Systems allows telescopic magnification and an unmagnified view of an object through the carrier. Can cause some confusion at first.
2. The telescope is used for short-term spotting activities.
3. Can be set as distance Rx or as a near point Rx (telemicroscope)
4. The engleman unit should be used to measure monocular patients.
5. The unit should be set as close to the eye as possible for maximum field.
6. In some states, a person is allowed to drive with a bioptic unit.

D. Binoculars - these are a resource the clinician should not overlook when considering an Rx for an individual for sport activities, plays, etc.

E. Telemicroscopes are telescopes focused for intermediate distances.

1. Surgical binoculars are preset telemicroscopes which provide 2.5x to 6.0x magnification.
2. A normal bioptic or full field telescope can be converted to a telemicroscope by adding reading caps.
3. The total magnification of a telemicroscope is the power of the telescope times the magnification (D/4) of the reading cap.
4. The telemicroscope has a greater working distance than a comparable microscope, but suffers a substantially reduced field.

CHARACTERISTICS OF COMMON OPTICAL AIDS

Telescopes:

A. Feinbloom telescopes (Galilean)

1. comes in powers of 2.2x; 3x; 4x
2. made in bioptic form
3. fixed focus
4. refractive error correction may be incorporated into ocular lens
5. field of view
    - a) 2.2x - 21°
    - b) 3x - 11°
    - c) 4x - 8°

B. 2.5x Selsi clip-on (or hand held)

1. also available in 2.8x
2. focusable
3. field of view
    - a) 2.5x - 10°
    - b) 2.8x -

C. 2.5x sportglass

1. also comes in 2.8x
2. focusable
3. can easily be dismantled to provide two monoculars

D. 6x/8x Selsi

1. One telescope that can be converted from 6x to 8x by changing objective lens
2. field of view
    - a) 6x - 11°
    - b) 8x - 8.2°

3. focusable

E. 10x Selsi

1. focusable
2. field of view 4°

Microscopes

A. Volk conoid lenses -

1. glass aspheric lenses
2. available in powers of +15D; +20D; +25D; +30D; +40D; +50D; +60D; +80D and +100D
3. cylinder can be incorporated in all but last three higher powers

B. A.O. lenses

1. glass in powers of 2x, 4x, 6x and 8x
2. plastic aspheric in powers of 6x, 8x, 10x and 12x
3. plastic high add bifocal cataract lenses in adds of +6.00D; +12.00D and +18.00D
4. half eyes in +6.00 (8$^{\Delta}$BI); +8.00 (10$^{\Delta}$BI) and +10.00 (12$^{\Delta}$BI)

C. Igard hyperoculars

1. aspheric plastic lenses
2. biconvex molded
3. powers of 4x, 6x, 8x and 10x

D. Designs for Vision

1. full diameter microscopes made of glass doublet or triplet lenses in powers from 2x to 20x
2. bifocal microscopic lenses - segment powers available from 2x to 10x
3. half eye in power from 2x to 10x

E. Keeler Optical
   1. large assortment of microscopic lenses from 2x to 20x
   2. all lenses fit monocularly

F. Fresnels
   1. in powers from -20.00D to +20.00 D
   2. in prism power up to 30^{Δ}

G. Ary Loupes
   1. resembles a jewelers loupe
   2. in powers of +10D; +11D; +12D; +16D; +20D; +25D and +32D

H. Magna-Add and Magna-U
   1. magna-add - places added lens on lower section as bifocal
   2. magna-u - places added lens on upper section of glasses
   3. available in powers of +1.25D; +2.00D and +3.00D

agnifiers:

A. Hand magnifiers
   1. 1x rectangular
   2. 3x windsor aspheric lens
   3. Easi-view
      a) chest supported
      b) ideal for sewing, knitting, etc.
      c) outer lens 5D
         inner lens 12D
   4. Selsi pocket magnifier - +11D; +14D
   5. B&L packette
      a) lens slides into rigid plastic case
      b) +11D; +20D
   6. Coil cataract hand reader
      a) aspheric, plastic
      b) +20D

7. Selsi folding pocket magnifiers
    a) lenses fold into hard plastic case
    b) comes as 2 lens or 3 lens
    c) +21D; +28D; +32D; +68D (total power)
    d) very small field of view with all magnifiers

B. Stand Magnifiers

1. Selsi bar magnifier
    a) spans a full line of print
    b) magnifiers in vertical meridian only
    c) +3.5 D
2. Selsi plano convex - +5D
3. Coil cataract stand magnifier
    a) aspheric
    b) +9 D; +18D
4. Jupitor stand magnifier - +19D
5. B&L illuminated stand magnifier - +5D
6. Agfa 8x loupe
7. Sloan magnifier
    a) illuminated
    b) focusable
    c) +18D; +23D; +29D; +37D; +44D and +53D

SECTION IV

Functional Ocular Anatomy

This section will discuss the anatomy of the eye and deviations in the structures of the eye that will affect the individual's ability to function visually.

I. The Normal Eye/Refractive Errors

II. Cornea

III. Lens

IV. Vitreous

V. Retina

VI. Optic Nerve

Functional Ocular Anatomy

I. Normal Eye/Refractive Errors

The sense of sight depends upon an external stimulus which is received by the eye in the form of light rays that pass to the retina through the cornea, aqueous, lens and vitreous. The varying optical densities (or refractive indices) of these structures cause the light rays to change direction as they pass through. If the image does not focus on the fovea of the retina, the object will appear blurred.

Light travels in the form of rays. When the source is close, the rays are divergent when they reach the viewer's eye. When the light source is distant, the rays are parallel. Because of the relatively small aperture of the eye (pupil), it is customary in optometry to consider rays of light farther than 20 feet away to be parallel.

The emmetropic or normal eye is one in which parallel rays of light are brought to a focus on the fovea without the use of accomodation. Accomodation is the mechanism by which the focusing apparatus of the eye adjusts to objects at different distances. Contraction of the ciliary muscle causes the lens of the eye to change shape, it becomes more complex, which increases the power of the eye and so divergent rays of light coming from within infinity are now focused on the retina. The mechanism is largely reflex and so well adjusted that normal individuals are not aware of the process.

A hyperopic (farsighted) eye is either smaller than normal or its component parts are weaker than the normal system. This particular condition fails to converge the rays of light enough to focus upon the fovea without the use of accommodation. The act of accomodation or placing convex (plus) lens in front of the eye helps converge the light to focus on the retina.

A myopic (nearsighted) eye is either larger than normal or its component parts are stronger than the normal eye. The rays of light tend to focus in front of the fovea. A concave (minus) lens in front of the eye helps to diverge the light rays to focus on the fovea.

Astigmatism is distorted vision caused by a variation in refractive power along different meridians of the eye. Most cases are due to irregularities in the shape of the cornea. Astigmatism is identified as to the type of cylindric lens needed to correct it: A concave cylinder would be used for myopic astigmatism and a convex cylindric lens for hyperopic astigmatism. Astigmatism may be simple or it may be combined with hyperopia or myopia. With mild degrees of astigmatism, there may be no symptoms or merely asthenopia with prolonged use of the eyes. The person with astigmatism tries to achieve a clearer image by rapidly changing focus (accom.) with resultant fatigue. With greater degrees of astigmatism, clear visual acuity may not be possible. At any distance, most cases of astigmatism can be corrected to 20/20 with cylindrical lens.

Presbyopia is a reduction in accommodative ability occuring with age, which causes difficulty in focusing on near objects and reading fine print. The average person requires his first reading glasses between the ages of 42 and 45. The power of accommodation has correlated with age, so that if this power of accommodation is measured, a fairly accurate estimate of the person's age may be made.

Now that we have a basic understanding of the general conditions which affect the eye, I will now divide the eye into its major components and attempt to show how some major pathologies can affect vision.

Tears are a mixture of 3 separate layers - the outermost oily layer, central aqueous layer, and an inner mucoid layer. The most important function of the tear film is to form an almost perfect optical surface on the cornea. It fills in all the irregularities producing a smooth refractive surface. Its second purpose is to serve as a lubricant for the eye and lids as the lids move over the exposed surface of the eye. A third purpose is to provide bacteriacidal action for protection of the sensitive corneal epithelium. Deficiency in any of the tear film components may lead to the dry eye syndrome. Patients with dry eyes complain most frequently of a scratchy or sandy sensation. In most patients when the eye is observed grossly it appears normal. This condition could lead to reduced acuity, photophobia and metamorphopsia.

II. Cornea

The cornea is the next major component: It is the transparent section of the eye's outer tunic. Together with the lens, the cornea serves to form the optical image of the retina. Of the cornea-lens combination, the cornea provides about 65% of the refractive power of the eye. The cornea can have this high refractive power even though it is much thinner than the lens because the cornea's anterior surface is in contact with the air to give a refractive index ratio of 1.377 to 1.000. The lens, although very thick and with high curvature, is surrounded by fluids of almost its own refractive index. The cornea is avascular and also it is in a relatively dehydrated state which both contribute to its transparency. It is also the most highly sensitive tissue of the body - containing about 70 naked nerve fibers, which account for the severe pain that results from seemingly minor irritations.

Since the cornea serves as the window of the eye and refracts light rays, corneal lesions cause some degree of blurred vision; blurring is greater if the lesion is centrally located. Scarring or perforation due to corneal ulceration is a major cause of blindness throughout the world. Most forms are corrected by therapy, but visual impairment can be avoided only if appropriate treatment is instituted promptly; in some cases this means within a matter of hours after onset. Corneal ulceration is caused by many agents: bacteria, viruses, fungi, hypersensitivity reactions, avitaminosis A and unknown causes.

Keratoconus is a condition beginning about puberty and developing mainly in females, in which the apex of the cornea thins gradually and usually bilaterally. This condition is inherited as an autosomal recessive trait. The presenting symptom is a reduction of the patient's vision which in the later stages cannot be corrected by lenses. Contact lenses improve visual acuity in the early stages but corneal transplantation is indicated when the corrected visual acuity is decreased to the point where it interferes with the normal activities of the patient.

Corneal dystrophies are a rare group of slowly progressive, bilateral, degenerative disorders which usually appear in the second or third decades of life. Some are hereditary, other cases follow ocular inflammatory disease and some are of unknown cause. In most cases the symptoms and signs are slowly progressive until useful vision is lost. Corneal transplants improve vision significantly in most cases.

Diseases of the cornea are extremely serious since improper management can result in permanent visual impairment ranging from slight blurring to total blindness. Most of the disabling complications of corneal diseases can be prevented by prompt and accurate diagnosis and appropriate treatment.

The eye is maintained in its inflated condition by having a liquid, the aqueous humor, continually produced in the eye and continually drained away. As was said previously, the aqueous is manufactured by the ciliary body and drains out the filtration canal system at the limbus. The main pathology that can occur in this area is glaucoma, which is an increase in I.O.P. and estimated 50,000 persons in the U.S.A. are totally blind as a result of glaucoma. The degree of interference with vision varies from slight blurring to complete blindness. In most cases, blindness can be prevented if treatment is instituted early. There are many classifications of glaucoma but generally glaucoma can be thought of as due to an increase in the amount of aqueous produces by the ciliary body or a blockage in the filtration angle which would also show up as an increase of aqueous in the eye. This later cause is generally the most common. With this uncontrolled build up of pressure, it eventually causes the optic nerve to atrophy. The larger the degree of atrophy, the greater the amount of blindness, since the optic nerve carries all visual impulses to the brain.

There is also a condition in which the I.O.P. is too low and this can often lead to retinal detachment and uveitis which will be discussed. A sustained abnormally low I.O.P. usually causes shrinkage of the entire eye until it is non-functional - this is called phthesis bulbi.

The uveal track is made up of three components: The iris - which is the colored part of the eye surrounding the pupil - it controls the amount of light entering the eye; the ciliary body which we said before produces the aqueous humor; and the choroid which lies between the retina and sclera - it supplies a large portion of the blood supply to the eye.

Inflammation of the uveal tract is called uveitis and its symptoms are injection or redness of the eye, photophobia and blurred vision. The blurred vision is due to a cloudy aqueous or vitreous.

When there is a partial or complete absence of the iris, it is called aniridia. This is an inherited congenital abnormality frequently associated with glaucoma. Photophobia is its biggest symptom along with reduced visual acuity.

III. Lens

The crystalline lens is a biconvex, avascular, colorless and almost completely transparent structure. It is suspended behind the iris by fibers which connect it with the ciliary body. The lens becomes larger and less elastic throughout life and as mentioned before, this is the reason for presbyopia. The sole function of the lens is to focus light rays upon the retina. The lens consists of 65% water and about 35% protein. There are no pain fibers, blood vessels or nerves in the lens. The only disorders of the lens are opacification (cataracts) and dislocation. Consequently, the patient with an opacity or dislocation of the lens will complain of blurred vision without pain.

Cataracts vary markedly in degree of density and may be due to a variety of causes but are usually associated with aging. Some degree of cataract formation is to be expected in persons over age 70. Most of bilateral, although the rate of progression in each eye is seldom equal. Most cataracts are not visible to the casual observor until they become dense enough (mature or hypermature) to cause blindness. The clinical degree of cataract formation, assuming that no other eye disease is present, is judged primarily by the visual acuity. Generally speaking, the decrease in visual acuity is directly proportional to the density of the cataract. However, some individuals who have clinically significant cataracts when examined with the opthalmoscope or slitlamp see well enough to carry on with their normal activities. Others have a decrease in visual acuity out of proportion to the degree of lens opacification. This is due to distortion of the image by the partially opaque lens.

In cataract operations, the procedure of choice is generally to remove the entire lens. The patient's condition is now called aphakia and he/she must wear a thick plus lens to compensate for the loss of his crystalline lens.

Partial or complete lens dislocation may be hereditary or may result from trauma. Hereditary lens disclocation is usually bilateral and may be associated with coloboma of the lens, Marfan's syndrome, and Hallerman-Streif syndrome. The vision is blurred particularly if the lens is dislocated out of the line of vision. If dislocation is partial, the patient may complain of monocular diplopia (double vision). Generally, when a lens is dislocated, it should be removed to prevent blockage of aqueous outflow leading to glaucoma.

IV. Vitreous

The vitreous is a clear, avascular, gelatinous body which comprises 2/3 of the volume and weight of the eye. It plays an important role in maintaining the transparency and form of the eye. If the vitreous were removed, the eye would collapse. When the vitreous is replaced by saline, as in certain forms of vitreous surgery, cellular matter and particulate debris are free to migrate into the optical pathway. The vitreous is about 99% water. The remaining 1% includes 2 components, collagen and hyaluronic acid, which give it its specific physical character.

Flashing lights are a common symptom. The patient is aware of a localized streak of light or flashing in his field of vision for which he can find no reasonable explanation. The light seldom persists for more than a fraction of a second. It frequently reoccurs at short intervals for a few minutes and then disappears for hours, days or even weeks. It is most readily identified on moving the eye especially when illumination is dim or absent. Although this phenomenon is unilateral, a similar episode commonly occurs in the other visual field. The light represents a cerebral awareness of a new abnormal vitreous stimulation of the retina. It is most commonly associated with a recent collapse and detachment of the vitreous. A careful history will readily distinguish it from the scintillating scotoma of migraine, which is characterized by a summetric quivering scotoma in both eyes, predictable configuration and progression, and variable nausea or headache.

Flashing lights require no treatment. The patient may be reassured that the symptom will pass. However, this may cause a retinal tear, retinal detachment or vitreous hemorrhage and therefore must be carefully watched and monitored.

V. Retina

The retina is a multi-layered sheet of neural tissue. A sensory structure, it contains cells that respond to visual stimuli by a photo-chemical reaction. Light must traverse most of the retinal layers in order to reach and stimulate the layer of rods and cones. Cones function best in bright light and mediate not only vision but also color. In the central areas of the retina, cones are more numerous than rods. In the macula itself, the area of most acute vision, only special cones are present. In contrast, rods are most numerous in the periphery of the retina. Since rods are extremely light sensitive, they function best in reduced illumination.

Therefore, the purpose of the retina with all its layers and specialized cells is to initiate impulses to the cortex via the optical nerve for visual perception.

Most disorders of the retina cause blurred vision. If the macular area is diseased, the patient's central visual acuity will be affected and he will have difficulty reading and discerning objects in the distance (eg. street signs). If the peripheral portion of the retina is diseased, side vision is impaired but the patient will continue to read. There is no pain with retinal disease (it contains no pain fibers), and the eye does not become red or inflamed.

In central retinal artery occlusion, there is an obstruction in the C.R. artery that feeds the retina. When this occurs, the result is sudden complete loss of vision in the affected eye. If the patient is seen within 2 hours of the onset of the symptoms, one should attempt to restore the blood flow by massaging the globe or perhaps with vasodilators. If this doesn't work, all vision in that eye may be lost.

In central retinal vein occlusion, there is an obstruction in the C.R. vein. This results in retinal hemorrhages and the patient usually complains of sudden painless loss of vision. As the hemorrhage clears, vision is usually decreased but not lost. Young patients with C.R.V. occlusion have a better prognosis than older individuals.

Diabetic retinopathy, which is one of the major leading causes of blindness in America, can be classified into two main types: nonproliferative and proliferative. The course and prognosis depend on which category the patient falls into.

Patients with nonproliferative retinopathy have changes which are confined to the retina. These retinal changes are characterized by dilation of veins, microaneurysms and retinal hemorrhages. Edema or exudates in the macular area are responsible for impairment of visual acuity. Over 60% of patients with visual impairment from diabetes suffer from nonproliferative retinopathy. In general, the prognosis with nonproliferative retinopathy is better than with the proliferative type.

The most outstanding feature of proliferative retinopathy is the formation of new blood vessels. This neovascularization may be limited to the surface of the retina or may involve the vitreous body also. Such patients have a very poor visual prognosis and there is no effective treatment for most stages of advanced proliferative retinopathy.

Retrolental fibroplasia is a bilateral retinal disease of premature infants. It was first reported in 1942 and caused total blindness in a large number of patients until the cause was found to be excessive oxygen given to incubator babies during the first few weeks of life. The high oxygen concentration caused an increase in proliferation of new blood vessels. Fibrovascular proliferation into the vitreous is followed by total retinal detachment. The extent of the pathology depends upon the individual's response to the conditions. Frequently glaucoma, uveitis, cataracts, and phthisis bulbi can occur months or years after the onset of R.L.F.

R.L.F. usually has its onset in the first few days of life and progresses rapidly to blindness over a period of weeks. Once blindness occurs, there is no hope for restoration of sight. Less commonly, the disease process regresses in one eye, allowing it to develop normal vision and there have been some cases where there is complete regression in both eyes.

Retinitis pigmentosa is a retinal degeneration of unknown etiology, it is an inherited disease and attacks predominantly males. The rods of the retina are slowly destroyed with secondary atrophy of the remainder of the retina. These changes begin in the mid periphery, sparing the macular and extreme peripheral areas until later.

Night blindness, the first symptom of retinitis pigmentosa, usually occurs in early youth. Thereafter, the visual fields gradually constrict to become disabling in the fifth or sixth decade, at which time macular vision may also be lost. There is no specific therapy for retinitis pigmentosa, genetic counselling should be offered in an attempt to prevent propagation of the disease.

Retinal detachment can be secondary to many disease processes or it could be caused by three factors: (1) a retinal hole, (2) liquid in the vitreous compartment with free access to the hole and (3) a force sufficient to break the bond between the retina and the pigment epithelium (the outermost layer of the retina). Until one or more of these factors is nullified, the detachment will continue to spread. Most of the retina may become detached in a few hours, or it may take years for this to happen. When the detachment spreads very slowly, the patient may be unaware of any problem until the macula is affected. Retinal detachments can often be repaired by surgery. Blind spots may be created but as long as the macula has not been damaged, vision will be good.

Senile macular degeneration is a very common disease process with people 65 years and older. It can also occur in young people who inherit it as juvenile macular degeneration. The condition is almost always bilateral, although at first only one eye is usually involved. Progression is gradual, but the end result usually is a dense central scotoma. Patients should be reassured that the disease does not lead to total blindness, although central vision may be extremely poor.

VI. Optic Nerve

Optic atrophy can be caused by a multitude of diseases and can also be inherited. The optic nerve head is pale when looked at by the doctor and the patient complans of a visual acuity loss along with field changes. It is rarely possible to treat optic atrophy unless the underlying cause can be found early and treated effectively. A good example is glaucoma which eventually leads to optic atrophy and then total blindness. By treating glaucoma in its early stages and keeping it under control, you can generally prevent any further optic atrophy.

I have tried in this discussion to give you some general idea into some of the many disease processes that can make a low vision patient. Believe me, there are many more hundreds of diseases that can affect the eye and the diseases I have discussed are more complicated than it sounds here. Suffice it to say, I hope you have gotten some small foundation of a few common pathologies affecting the low vision patient.

SECTION V

Clinical Examination of the Visually-Impaired and Multiply-Handicapped Student

This chapter will review the main components of the most important parts of the low vision examination process. It includes the social service and clinical history, as well as examination techniques. This exam data will be supported by, or contradicted by the evaluations and assessments done by the educators and other professionals in the field.

I. Patient Resource Assessment (Social Service Intake)

II. Discussing some categories in a case history

III The main areas in a low vision case history:

1) Patient objectives,
2) Visual history,
3) Medical history,
4) Family history,
5) Mobility,
6) Distance vision,
7) Illumination,
8) Near vision,
9) Motivations (activity level)

IV. Examination Techniques:

1) Goal of the examination,
2) Distance acuities
3) Near acuities
4) Keratometry
5) Retinoscopy
6) Subjective
7) Fields
8) Binocular vision
9) Ophthalmoscopy
10) Color vision testing
11) Training
12) Magnification determination

V. Multiply-Handicapped Children

1) Visual acuity
2) Refractive Error

3) Binocularity
4) Fields

VI. Interpretation of an Eye Report

KERATOMETRY: A test which measures the curvature of the cornea. One of the most important parts of the examination. Often overlooked.

1. gives insight on the regularity of the cornea. Can tell you if part of your treatment plan should be contact lenses.
2. gives a good indication as to how much astigmatism and at what axis. Sometimes a lot of astigmatism may be overlooked because reflex not seen with retinoscopy and patient too blurred to determine darker lines on a grid or clock dial.

RETINOSCOPY:

A. Very important test in the determination of a final prescription for a low vision patient. It is a method of determining a patient's refractive error.

SUBJECTIVE:

All low vision patients are to be refracted through a trial frame. This insures that the patient's refractive error will be corrected and allow the clinician to provide an optimum optical aid. With a young population, you may find as many as 60% benefiting from conventional lenses or contact lenses - not previously prescribed. The importance of spending lots of time on the subjective refraction can not be over-emphasized.

B. Telescopic subjective - refinement of sphere and cylinder is accompanied by doing a subjective behind a telescope. This is particularly important if a spectacle telescope is being considered as one possible treatment option.

FIELDS:

The following field studies are important to the low vision evaluation:

1. Amsler Grid

   a. evaluates macular area,
   b. realistic test in respect to reading because test done at normal reading distance,
   c. can evaluate metamorphopsia besides any scotomas,
   d. 1 square equals 1° at 30cm.

2. Tangent Screen

   a. evaluates central 30° field
   b. a central fixation target can be established by pinning a white X on the tangent screen so that it intersects at the point of the fixation target,
   c. evaluation of size and density of scotoma is important when working with magnification,
   d. also important for mobility purposes

3. Arc Perimeter (not always done unless severe field restrictions noted)

   a. evaluates peripheral field,
   b. provides orientation and mobility data

BINOCULAR VISION

1. Should not be overlooked as a possible treatment option.

2. exists less frequently when visual acuity is less than 20/200, especially in the presence of nystagmus.

3. Advantages:

   a. larger field of view,
   b. greater depth of focus,
   c. improved visual acuity,
   d. appearance of conventional glasses,
   e. psychological value because patients prefer to use both eyes

OPHTHALMOSCOPY

A. should be done on all patients even though they have been previously diagnosed.

   1. Determine if its an active pathology - possible referral back to his ophthalmologist.

EXTERNAL EXAMINATION

A. should proceed as it is normally done with the routine patient: lids, cornea, sclera, pupil and pupillary reflexes, and iris all should be examined and all abnormalities noted.

B. special attention should be given to eye movements and fixation.

Nystagmus should be noted and a gross evaluation of the amount of eccentic fixation should be recorded if possible.

MULTIPLY-HANDICAPPED CHILD

In evaluating the multiply-handicapped child the examiner must approach five areas:

Ocular Health - all previous medical records from pediatricians, neurologist, ophthalmologists, etc. should be reviewed. Normal evaluations of ocular health should be conducted.

Acuities - the level of vision potential needs to be evaluated. We need to know if the child sees or not (teacher reports, pupil response, paired lights/reward, ERG). Then the level of function can be determined by observing child perform visually with a task object as small as possible and then as far away as possible). Cookie acuity at 5' is much more significant than "not testable", so the clinician should be encouraged to use these notations.

Refractive Error - A refractive error correction may be needed to improve upon the acuities measured above. If normal tests of retinoscopy, etc. don't work; trial corrections can be used. Watch for behavior changes in specified and structured tasks in the classroom, etc.

Binocular Vision - Testing should indicate child's ability to use both eyes together.

Fields - this is the most difficult evaluation to perform. Field losses are determined through observation and then confirmed with various aspects of confrontation testing. It requires two people and utilizes the child's favorite toys, rewards, etc. as test objects.

The most important attributes in testing the multiply-impaired child is team cooperation and time.

SECTION VI

Vision Stimulation Techniques for the Multi-handicapped Child

This section will describe a sequential approach for integrating the visual system with the child's remaining functional modalities. Emphasis will be placed on teaching sequences, activities and equipment. Common problems encountered while working with the multi-handicapped child and suggestions for remediation will be described.

I. Observation of the Child
II. Attention to any Stimulus
III. Pairing visual stimulus with "attention" stimulus
IV. Attention to visual stimulus alone
V. Tracking of visual stimulus
VI. Awareness of "on and off" of lights
VII. Background illumination and opaque forms
VIII Generalization to varying environmental lighting conditions
IX. Awareness of objects
X. Attending to objects
XI. Tracking objects
XII. Reaching and moving towards lights and objects
XIII. Objects in space

SECTION VII

Vision Stimulation for the Visually Impaired Child

This section will describe a sequential approach for teaching visual perceptual skills. Teaching methods, materials and lesson sequences will be discussed.

I. The Visual Process

II. "Learning to See"

III. Three Dimensional Form Perception

IV. Two Dimensional Form Perception

V. Pictorial Figures and Scenes

VI. Object and Picture Puzzle

VII. Abstract Symbology

VIII Sequence of Activities for the Development of Visual Perceptual Abilities

Vision Stimulation for Visually Impaired and Multi-Handicapped Children

A. Observe the child for change in behavioral response to any stimuli. Then observe for anything that leaves a doubt in your mind as to whether or not the child is functioning visually. Examples of behaviors to observe are facial straining, postural changes such as head tilt, compensatory body adjustments and different visual behaviors such as light-gazing and flicking. Regarding gait, does the child shuffle his/her feet, walk with head down, etc? Observe the child's mobility. Does he/she move with ease and speed? Is smooth range of movement exhibited? Does the child avoid or bump into objects? If child bumps into objects, where are they located (e.g. head high - waist high, low lying) and is child consistently bumping one side more than the other? Is the child functioning more on a visual or other sensory level (e.g. groping behavior, exploration with eyes, hand, mouth, etc.)

B. Awareness of lights - Even if child exhibits no visual behaviors, check for awareness of lights. Several different types of lights should be experimented with, as many children may not exhibit responses to penlights or flashlights. Placing different-colored filter paper in front of light source, using flickering or colored lights, shining lights through a translucent surface or pairing light with any stimulus that child consistently responds to are examples of various types of light sources and ways of presenting them. Monitor child's response to light (e.g. turns to avoid light, pushes it away, constriction of pupils, reaches for light) Note area of visual field where child consistently responds or doesn't respond to lights. Light source should be presented in all areas of visual field.

NOTE: Do not assume that there is no visual functioning if pupil do not constrict.

C. Tracking lights - lights should be presented horizontally, vertically, obliquely and circularly, and observation of how child tracks lights should be noted (eg. with head, eyes or head). Are eye movements smooth or jerky? Does child lose the light at his/her midline or experience difficulty following the light across midline? When teaching these visual-motor skills, observe the following sequence.

1. head-movement tracking
2. eye-movement tracking
3. head and eye movement tracking

If the child does not respond to tracking, initially, it may be necessary to physically pattern him/her. Trainer should move the child's head in the direction of the light source, until child can do this independently. When moving on to eye-tracking, trainer initially may need to hold the child's head, allowing eye movement independent of head movement. As child masters this tracking skill, head and eye movement are then combined. During the initial stages of tracking skills, trainer should combine child's other senses (i.e, allow child to hold light source as it moves and give verbal cues as to direction of movement) Gradually, these additional sensory cues are removed and the child is required to track by visual cues alone.

NOTE: Trainer should be alerted to the possibility of tactual defensiveness and results of conditions such as cerebral palsy, where separation of head and eye movement may be difficult or touch off an A.T.N.R. reflex. In the above instances, and for many children with additional handicaps, correct positioning is essential in facilitating vision. Consultation with occupational and/or physical therapists is most important in this area as incorrect positioning of the child may preclude success in stimulating his/her vision. Provide child with appropriate light sources, which will encourage as much independent manipulation as possible.

D. Object Awareness - Initially the child may not be aware of an object as we perceive it. Instead, he/she may attend to an object as a blockage of light. Attention may also be due to characteristics of object. Trainer should experiment with as many objects as possible (eg. brightly colored, light - reflecting, multi-patterned, different-sized, noise-making, etc). Varying the intensity of background contrast and illumination is important. Combining tactual with visual exploration serves as a system for integrating information with a previously experienced feedback system. At this point, the child's observable functional field should be known and presentation of objects should be initially directed in those areas. However, presentation of objects in other areas of the child's visual field should continuously be explored.

E. Object Tracking - follow the same procedures as in light tracking, substituting object for lights. Emphasize a diversity in objects presented. Examples of common objects that can be used include: balls, tops, wind-up-toys, friction toys, bubbles, balloons, puppets, etc.

F. Object manipulation - child should be encouraged to explore objects in space (e.g., large balls in small areas, moving toys, interaction with objects in obstacle courses, etc.) Emphasis should be placed on eye-body coordination tasks. Initially, the child may need physical patterning for correct movements, as trainer should not expect appropriate eye-hand or eye-foot coordination. Trainer should direct child's hand and foot movement into child's functional field of view. See attached references for eye-hand coordination activities. Lights or objects may be used.

The above sections focus on moving the child through the initial stages of vision stimulation. The child should now be ready for work in the more advanced stages of visual perception. Knowing that the child has been adequately prepared and guided through stages of visual awareness and eye-motor coordination to active manipulation of objects in his/her environment, the instructor then further reinforces the visual system while helping the child build a visual memory. Remember that it is not important how clear or blurry the image appears to the child. It is how the child is able to interpret this blurred image and what meaning he/she can assign to it that is integral to a "clearer" visual perception of his/her world.

As Natalie Barraga states: " The visual functioning ability of the child is primarily developmental--the more the child looks, especially at close range, the more he stimulates the pathways to the brain. As the brain is given more and more information, there is an eventual accumulation of a variety of visual images and memories. One of the primary problems of the low vision child is that there is very little which he can "pick up" just incidentally through his visual sense. He needs to be taught the process of discrimination between the forms, outlines, pictures, and symbols which may never have been brought to his attention. This process doesn't "just happen" when he looks; it is a complex pattern of learning, beginning with the very simplest types of visual forms and progressing gradually to more detailed patterns of visual representations.

Visual perception is much more than clearness and sharpness (acuity), it is the ability to construct a visual image, to make distinctions in terms of differentiating characteristics, and to give some meaning to what one sees.

The sensory function of the eye/s is so closely related to perceptual development in the brain that it seems clearer to talk about visual perceptual development. The child with low vision, never having been stimulated "to look" for the purpose of making discriminations, probably has visual perceptions which are blurred, and objects are likely to appear as vague masses. There is no specific form, no contour, and no spatial location to what is seen. The continuous searching with the eye/s enables the child to focus on the details so that what he is looking at begins to stand out from the background and the "blob" takes on a specific form or contour. The continued looking with the eye/s reduces the blurring effect so that each object viewed begins to have a definite form and the image becomes constant. When a specific form always appears with the same characteristics and is distinct from other forms, a name can be assigned to it, and the child can soon recognize it and label it by name. The form may be clear or fuzzy, large or small, be lying down or sitting up, but it is the same form and has the same name.

By understanding this process, we can more easily accept the fact that children "learn to see." When the eye itself is functioning normally, the child learns visually by himself for the most part, but when vision is impaired in the eye, he must be led carefully step by step in his visual development and taught how to use the vision he has and to understand what he is able to see.

In addition to the physical (eyes and their function) and perceptual-cognitive (brain) aspects of seeing, there is another important factor in "learning to see" --the psychological feelings and attitudes. Children have varying degrees of interest and motivation in learning generally--the same is true when applied to visual learning. If the child wants to "learn to see" by looking, he will try harder and probably tire less quickly. The child who has the attitude that he can "learn to see" will work harder also because he will want to feel the joy of actually being able to use his eyes.

With consideration of these three factors, physiological, perceptual-cognitive, and psychological, teachers need to be concerned with the maximal use of low vision as a part of the child's total learning potential. The development of visual abilities to the highest possible level of efficiency is based upon the understanding and acceptance of the following:

1. The development of visual ability is not innate and automatic.
2. Visual ability is not determined nor can it be estimated

by visual acuity measurements alone.

3. Visual ability and functioning is not related necessarily to the kind or degree of impairment or loss.
4. Visual ability and efficiency may be learned through a sequential program of visual experiences."

Once it has been determined that the child is able to see objects the following sequence is suggested:

A. Three-Dimensional Form Perception

Emphasis here is on tangible concrete objects which the child is encouraged to manipulate tactually while his/her vision is directed towards the object. The tactual sense is usually the sense with which the child is most familiar and feels more secure. Combining an already established sensory system along with the use of vision enables the child to optimally integrate information. Materials such as balls, blocks, sylinders, cubes and spheres as well as common environmental objects, emphasizing curves, lines, paints and contours should be made available to the child. Place both tactual and visual stress on features such as angles and curves which facilitate the discrimination of these objects. Continued practice and reinforcement enable the child to associate certain features with specific objects and gradually help the child build a visual memory. As a visual memory is being acquired, identification of objects becomes easier since the child now has a system for matching and labeling. Attention should be paid to providing optimal contrast in working materials and background.

A variety of size, colors and light-dark intensity should be experimented with.

B. Two-Dimensional Form Perception

Emphasis now shifts from concrete objects to representations of these objects. Drawings of cercles, squares, triangles, etc. are used while reinforcing previously learned information about angles and curves. Tactual feedback is de-emphasized and visual search and discrimination is focused upon. Initially, it may be helpful to allow the child to trace fiqures with his/her finger while folowinq with his/her eyes. This kinesthetic feedback can be helpful in bridging the gap from the combination of visual and tactual to using the visual sense alone.

C. Pictorial Figures and Scenes

Here the child moves from simple pictures of shapes to those depicting actions and different situations. Greater figure-ground detail must be gradually introduced as, initially too much complexity in the pictures can confuse the child. Remember that in many cases the child will not be initially perceiving the picture as we do (i.e. the child will be focusing on features such as angles and curves and not seeing in the perspective with which we view the picture.) Concentrate on pointing out specific details to help the child distinguish differences in action, background from foregound, etc. Sequence pictures can be used to reinforce changes in action and events and enable the child to relate stories in sequence of events.

D. Object and Picture Puzzles

While initially helping the child to assemble puzzles, concentrate on skills for organization, visual closure, visual memory and visual unification (See references)

E. Abstract Symbology

After the above areas have been taught and reinforced the child is ready to concentrate on details for distinguishing letters, then words and sentences. Concentration in areas of discrimination, recognition, association perceptual interpretation and reading should follow in sequence only after the child has been guided through necessary prerequisite skills in visual-motor and visual perceptual activities. Even if the child demonstrates an ability to distinguish letters, an evaluation should be given in all prerequisite sequential areas to reinforce a strong base for subsequent visual activities in this area.

It is suggested that the child should be guided through each of the above five areas following this sequence of activities for the development of visual perceptual abilities:

1. Likeness and Difference in forms: objects and symbols. Discrimination of sizes, spatial positions and inner details.
2. Matching of different shapes and classes of forms, objects and symbols.
3. Sorting of shapes and objects, then letters and words into classes and categories.

4. Ordering in term of increasing and decreasing sizes sequence of events.
5. Category Grouping in terms of size, color, class, use or relationship.
6. Recognition of missing parts of known forms, objects, letters and works (with the whole visible, then without the whole visible).
7. Identification of missing parts of known forms, objects, letters and words (with the whole visible, then without the whole visible).
8. Integration of separate parts into whole by use of puzzles, manipulation of objects, drawing from partial models and then from memory.

It is important to stress the sequential aspect of moving through these areas, as for instance, requiring the child to identify missing parts before he/she is familiar with the concept of likeness and difference, may cause frustration and affect the child's motivational level and desire to continue with visual activities.

NOTE: For further teaching suggestions, lesson plans, etc. refer to bibliography.

VISION STIMULATION FOR VISUALLY IMPAIRED AND MULTI-HANDICAPPED CHILDREN

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4. Ficociello, Carmella, "A Sequential Approach to Developing The Use of Residual Vision In Deaf-Blind Children." South Central Regional Center for Deaf Blind Children, c/o The Callier Center of Communication Disorders, 1966 Inwood Rd, Dallas, Texas

5. Ficociello, Carmella, "Vision Stimulation for Low Functioning Deaf-Blind Rubella Children." (SCRC) c/o The Callier Center for Communication Disorders, 1966 Inwood Rd, Dallas, Texas

6. Ficociello, Carmella, "Manual for Visual Assessment", South Central Regional Center for the Deaf-Blind Children, c/o The Callier Center of Communication Disorders, 1966 Inwood Rd., Dallas, Texas

7. Fostig, M. and D. Home, Teacher's Guide for the Fostig Program for the Development of Visual Perception - Follett Publishing Co., Chicago, 1964

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9. Groves, Cathy, "Pre-Reading and Reading Skills for Deaf-Blind Children" (SCRC) c/o The Callier Center for Communication Disorders, 1966 Inwood Rd., Dallas, Texas

10. Langley, B and R. Dubose, "Functional Vision Screening for Severely Handicapped Children" The New Outlook for the Blind Oct., 1971

11. O'Brien, Rosemary, Vision Stimulation - A Program of Instruction Designed to Stimulate The Use of Residual Vision In Children With Low Vision. Bulletin #227, Montgomery County Board of Education, Rockville, MD., 1969

12. Vision Observation System - An Approach to Observing and Interpreting Functional Vision of Trainable Retarded Students, c/o The Vision Team, West Cottage, 6025 Eden Prairie Road, Minnetonka, MN 55343

13. When It's Hard To See Office of Special Education, 6037 Central Avenue, Capital Heights, Maryland, 2027

14. When It's Hard To See, Making It Easier, 6037 Central Avenue, Capital Heights, Maryland, 20027

FILMS:

. "Consider Me Seeing" - a 40 minute documentary of a vision stimulation program at the W. Pa. School for the Blind Children Emphasis on evaluation and training techniques.

Available through:

1) Audio-visual department
Hillman Library
University of Pgh.
Pittsburgh, PA 15213

2) Public Relations Department
W. Pa School for Blind Children
201 N. Bellefield
Pittsburgh, PA 15213

2. "Look At Me" - a 30 minute documentary of a vision stimulation program at the Upsal Day School for Multi-Handicapped Blind Children. Emphasis on evaluation and training techniques

Available through:

Upsal Day School
Center for the Blind
220 W. Upsal Street
Phila., PA

SECTION VIII

NON-OPTICAL AIDS

Various non-optical aids and their resources are discussed in this section. There are many more aids than those suggested here so it would be best to obtain the catalogues from the manufacturers.

I. Writing utensils
II. Sewing aids
III. Cooking utensils
IV. Games
V. Medical devices
VI. Illumination control systems
VII Reading materials
VIII Reading stands
IX Illumination

NON-OPTICAL AIDS

WRITING UTENSILS:

- signature guides:
  - plastic or metal with aperture for signing one's name
  - AFB less than $1.00
- plastic script guide:
  - raised lines to serve as a guide to prevent writing one line over another; 3"x5", 5"x8"
  - AFB $2.25
- check stencil:
  - template for filling in a check, blank sample check must be submitted
  - AFB $2.25
- felt tip pens:
  - black or navy
  - stationary store

Telephone dial:

- white plastic with large raised black numerals and smaller letters also raised; tape on back of dial to affix to telephone
- AFB/LH less than $1.00

Sewing Aids:

- tape measure:
  - 5' tape with large inkprint markings and wire staple indications for tactual reading
  - AFB $2.25
- self-threading needles
  - thread stretched across slot at end of needle, then pulled into the eye
  - AFB less than $1.00
- hex-threader:
  - plastic unit which threads the needle itself
  - AFB less than $1.00
- dritz hem/sewing guide:
  - double pointed slider; marks tucks and pleats, spaces buttonholes, marks hem depth; notches on one side, holes on the other side every ½ inch
  - AFB 50¢

COOKING UTENSILS:

gas stove lighter:
operates on 2 flashlight batteries; when button is depressed, coil glows to light gas
AFB $4.00

flame tamer: heavy metal plates to control flame; helps to prevent boil-over, sticking, and scorching
AFB $5.00

splatter guard:
aluminum mesh which is placed over the pot allowing steam to escape; keeps grease from splattering; allows liquid to be added; used for straining also
AFB $2.50

sunbeam frypan:
removable automatic heat control; tactual temperature indications very 40° to 420°
AFB $27.00 - $35.00

large print cookbooks:

Betty Crocker Kitchens
General Mills, Inc.
Box 1173
Minneapolis, MN 55440

Campbell Cookbook
Volunteers Service f/t Blind
919 Walnut Street
Philadelphia, PA 19107

GAMES:

jumbo playing cards:
oversized symbols and numbers; pinochle or regular decks
AFB/LH $1.00-$2.50

bingo board:
board with recessed white squares with large black printed numberals and braille
AFB $3.50 - $6.00

checker set:
sunken 1" squares; checkers are round and square for easy identification
AFB $5.00

MEDICAL DEVICES:

must be ordered by doctors or registered nurses, not individual patients.

Hill Accurate Dosage Insulin Syringe: 80 unit
plunger set to correct dosage and locked by double lock rings; can be easily disassembled and reassembled without disturbing the setting; clicks when filled.
AFB $7.00

Becton, Dickinson Syringe: 80/100 unit
syringe fits inside metal pipetting holder which has adjustable stop; needle inserted into vial, plunger pushed down and automatically draws correct amount; disassembled without disturbing the setting for cleaning
AFB $14.50

Insulin Needle guide:
guide can be made to the specific requirements to help locate center of cap of insulin vials without blunting the needle
AFB $4.50

ILLUMINATION CONTROL SYSTEMS:

NoIRS:
eliminates infrared and ultraviolet rays; designed to fit over prescription glasses or worn alone; has side shields and small visor on top
14% 19% 1% green
7% cosmetan 7%
Rec. Inn $7.00-$26.00

visorettes:
fits directly on glasses for protection from glare;
opague black
LH less than $1.00

fit in sunshades
fits behind regular eye glasses; dark grey
Apex

READING MATERIALS:

- Merriam-Webster dictionary for large print users:
  - G.K. Hall & Co. $27.50
  - 70 Lincoln Street
  - Boston, Mass
- Large Print Book Club:
  - 6 per year required
  - G.K. Hall & Co.
- Large print Reader's Digest: $12.95/year
  - Louise Todd - Dept. J.
  - Large-Type Edition
  - Reader's Digest Fund f/t Blind, Inc.
  - Pleasantville, N.Y. 10570
- Large print New York Times:
  - N.Y. Times Co. $44.00/yr.
  - P.O. Box 2570
  - Boulder, Colo
- Libraries f/t Blind and Visually Handicapped

- Talking books/cassettes

- Typoscope:
  - reading slit made from black plastic; aids in contrast and eliminates extraneous light
  - LH 25¢
- Large print Bible and Psalms
  - American Bible Society

READING STANDS:

- adjustable stand to bring printed material close with both hands free
- low vision reading stand:
  - table model
- Shafer reading stand:
  - floor model
  - American Printing House

ILLUMINATION:

- high intensity gooseneck lamp:
  - adjustable arm to direct light
  - Luxo Lamp Corp.

American Bible Society
P.O. Box 5656
Grand Central Station
New York, N.Y. 10017

American Foundation f/t Blind
15 W. 16th Street
New York, NY 10011

Lighthouse f/t Blind
111 East 59th Street
New York, N.Y. 10022

American Printing House f/t Blind
1839 Frankfurt Avenue
Louisville, Kentucky 40201

Recreational Innovations Co.
P.O. Box 203
Saline, Michigan 48176

Luxo Lamp Corp.
Monument Park
Port Chester, N.Y. 10573

2 : a shortened form of a word or phrase used for brevity esp. in writing

¹ABC \ˌā-(ˌ)bē-ˈsē\ *n, pl* **ABC's** *or* **ABCs** \-ˈsēz\ **1** : ALPHABET — usu. used in pl. **2** : RUDIMENTS

²ABC *abbr* American Broadcasting Company

ab•di•cate \ˈab-di-ˌkāt\ *vb* **-cat•ed; -cat•ing** : to give up (as a throne) formally — **ab•di•ca•tion** \ˌab-di-ˈkā-shən\ *n*

ab•do•men \ˈab-də-mən, ab-ˈdō-mən\ *n* **1** : the cavity in or area of the body between the chest and the pelvis **2** : the part of the body posterior to the thorax in an arthropod — **ab•dom•i•nal** \ab-ˈdäm-ən-ᵊl\ *adj* — **ab•dom•i•nal•ly** \-ē\ *adv*

ab•duct \ab-ˈdəkt\ *vb* : to take away (a person) by force : KIDNAP — **ab•duc•tion** \-ˈdək-shən\ *n* — **ab•duc•tor** \-tər\ *n*

abeam \ə-ˈbēm\ *adv or adj* : on a line at right angles to a ship's keel

abe•ce•dar•i•an \ˌā-bē-sē-ˈder-ē-ən\ *n* : one learning the rudiments of something

abed \ə-ˈbed\ *adv or adj* : in bed

ab•er•ra•tion \ˌab-ə-ˈrā-shən\ *n* **1** : deviation from the normal or usual : DERANGEMENT **2** : failure of a mirror or lens to produce exact point-to-point correspondence between an object and its image — **ab•er•rant** \a-ˈber-ənt\ *adj*

abet \ə-ˈbet\ *vb* **abet•ted; abet•ting** [ME *abetten*, fr. MF *abeter*, fr. OF *beter* to bait] **1** : INCITE, ENCOURAGE **2** : ASSIST — **abet•tor** *or* **abet•ter** \-ər\ *n*

abey•ance \ə-ˈbā-əns\ *n* : a condition of suspended activity

ab•hor \əb-ˈhȯr, ab-\ *vb* **ab•horred; ab•hor•ring** : LOATHE, DETEST — **ab•hor•rence** \-əns\ *n*

ab•hor•rent \-ənt\ *adj* : LOATHSOME, DETESTABLE

abide \ə-ˈbīd\ *vb* **abode** \-ˈbōd\ *or* **abid•ed; abid•ing** **1** : DWELL, REMAIN, LAST **2** : BEAR, ENDURE

abil•i•ty \ə-ˈbil-ət-ē\ *n, pl* **-ties** : the quality of being able : POWER, SKILL

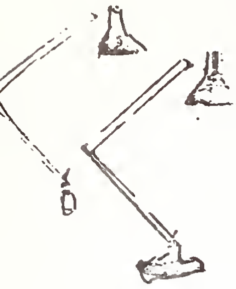
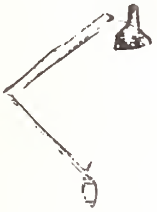
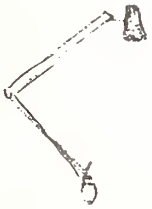
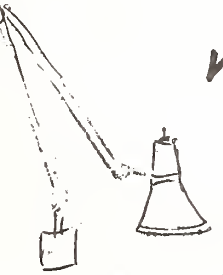
ab•ject \ˈab-ˌjekt, ab-ˈjekt\ *adj* : low in spirit or hope : CRINGING — **ab•jec•tion** \ab-ˈjek-shən\ *n* — **ab•ject•ly** \ˈab-jekt-lē, ab-ˈjekt-\ *adv* — **ab•ject•ness** *n*

At Last...
A dictionary EVERYONE can read!

The Merriam-Webster Dictionary for LARGE PRINT Users

INCANDESCENTS

Heavy duty adjustable arm lamps for industry, office, school, laboratory and home.

	DESCRIPTION	MODEL & COLOR
	**FLAIR/LS SERIES** 45" adjustable arm with 5" diameter Flair shade, inner reflector and porcelain socket. All LS models have 2 conductor cord sets and come with a 60 watt bulb.* Flair model LS-1/A includes a clamp for mounting to horizontal surfaces. Flair model LS-1/F includes an adjustable clamp for mounting to non-horizontal surfaces (drafting tables). Flair model LS-1/E includes a weighted base for table or desk mounting. LS models can be *special ordered* (no freight allowed) with 3 conductor cord set: add	LS-1/A LS-1/F LS-1/E Gray, Tan, Oyster, Black, White, Red, Yellow, Blue, Brown LS-1/A LS-1/E Chrome
	**CLASSIC/L SERIES** Adjustable arm with 6¾" diameter Classic shade, inner reflector and porcelain socket. All L models have 3 conductor cord sets and come with a 60 watt bulb.* Model L-1/A has a 45" reach and comes with a clamp for mounting to horizontal surfaces. Model L-2/A has a 30" reach and comes with a clamp for mounting to horizontal surfaces.	L-1/A Gray, Tan, Oyster, Black L-2/A Gray
	**BULLET/LB SERIES** Adjustable arm with 4½" diameter bullet shade, inner reflector and porcelain socket. All LB models have 3 conductor cord sets and come with a 60 watt bulb.* Model LB-1/A has a 45" reach and comes with a clamp for mounting to horizontal surfaces. Model LB-2/A has a 30" reach and comes with a clamp for mounting to horizontal surfaces.	LB-1/A Gray LB-2/A Gray
	LIL-E 24" adjustable arm with an inner reflector and precelain socket on a weighted base. Has a 2 conductor cord set and comes with a 40S11 bulb.	LIL-E Black, White, Red, Yellow LIL-E Chrome
	HEADLIGHT Wall mounted pin-up or headboard clamp-on lamp with patented Luxo neck design and porcelain socket. Comes with a 2 conductor cord set and 50R20 reflector bulb.	D-10 Oyster, Black, White, Red
	✓ **CROWNLITE 2** An economy version of the famous Luxo with a 36" adjustable arm, patented neck design, and four-way mounting bracket. Comes with a 2 conductor cord set and 60 watt bulb.*	CS-4/M Gray, Black, White, Red, Yellow, Blue, Orange, Brown
	LUMAGLO An all purpose lamp with a 36" adjustable arm, translucent shade (brown and black models non-translucent) and two-way mounting bracket. Comes with a 2-conductor cord set and 60 watt bulb.*	LG-4/N Black, White, Red, Yellow, Orange, Brown

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*For economy and energy savings a 60 watt incandescent bulb is recommended for most Luxo incandescent lamps. A 60 watt incandescent bulb will produce 150 foot candles of illumination at the task when the light source is a distance of one foot. This level of illumination is recommended by the Illuminating Engineering Society for business offices, particularly accounting, auditing, tabulating, bookkeeping, business machine operations and similar functions. If greater illumination is desired, the components of all Luxo incandescent lamps are engineered and UL approved for bulbs up to and including 100 watts.

NoIR

RECREATIONAL INNOVATIONS COMPANY

POST OFFICE BOX 203 • SALINE, MICHIGAN 48176 • TELEPHONE 313-769-5565

MEDICAL PRODUCTS DIVISION

NoIR **Sunglasses**

NoIR The Care, Cleaning and Adjustment of

Sunglasses

NoIR is much more than a normal sunglass . . . it is superior eye protection and comfort for all kinds of light conditions. **NoIR's visible light transmission curve offers good acuity in distance viewing while providing a low level of light transmission for maximum protection from glare. Unlike other plastic sunglass lenses, the NoIR lens keeps near infrared light transmission well below the level of visible light transmission. All Ultraviolet light rays are completely blocked.** The NoIR sunglass may be worn over most prescription frames (even cataract) or alone as a plano.

RECREATIONAL INNOVATIONS
P.O. Box 203 / Saline, MI 48176 / (313) 769-5565

CARE:

All plastic lenses are susceptible to scratching. Never lay your NoIR sunglasses with the lenses face down. When not wearing your NoIR sunglasses, keep them in the special tricot-lined carrying case which is provided. Store in a shaded area, away from above normal temperatures.

CLEANING:

A. Use only mild soap and warm tap water to clean lenses.
B. Shake off excess water . . . **BLOT, we repeat, BLOT DRY** with a soft, pure cotton cloth only. (Most materials, including facial tissue, are abrasive and can scratch.) **NEVER, NEVER, NEVER WIPE THE LENSES!**

ADJUSTMENT:

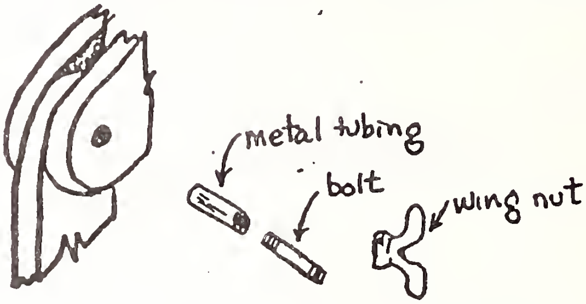
A. Heat the temples in warm water or hot air (hair dryer)
B. Bend temples gently but firmly to the desired fit.
C. Allow to cool for maximum longevity of adjustment.

Dear Sir:

Attached is your copy of the Low Vision Reading Stand. All materials are made from 3/4" plywood, except for the platform itself, which can be made from 1/2" plywood.

For smoother movement of the arms and platform, it is suggested that metal tubing (supplied by local hardware store) be put into the moveable joints.

(ie.)



The bolts used in locking the stand in a stationary position should be as large as possible (approximately 3/8" to 1/4" wide). This will both aid the patient in setting up the stand as well as to keep the stand in a stationary position. We used large size washers on the outside of the moveable joints . This helped to tighten down each joint.

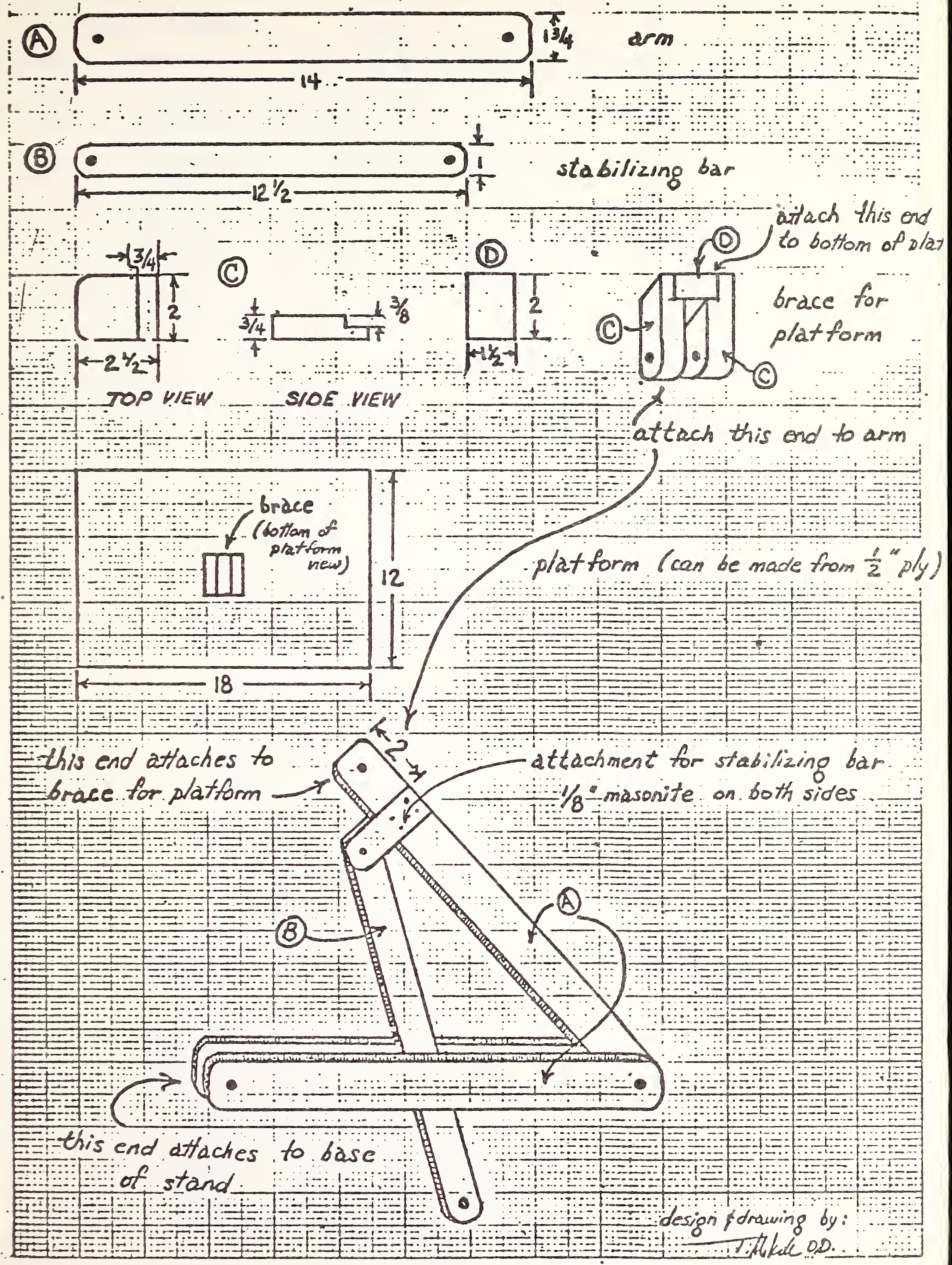
The spring is approximately 1/4" wide and 8" long. Place it in approximately the same area of the stand as pictured in the article.

If you have any additional comments or questions, please do not hesitate to contact me at the following address:

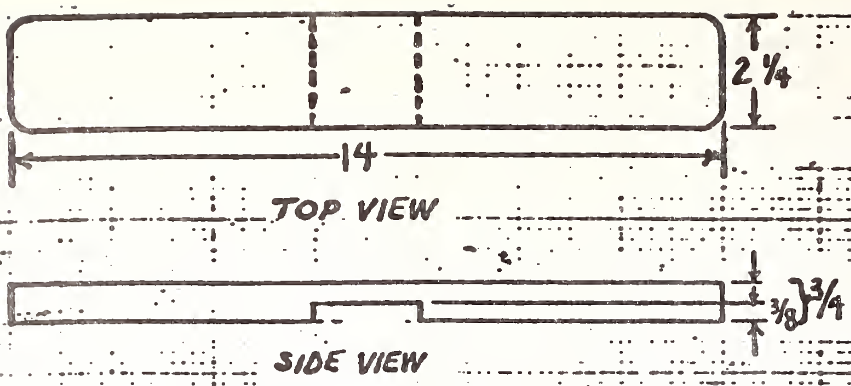
Tom F. Mihok, O.D.
c/o Michael Fukai, O.D.
515 Kimbark St.
Longmont, Colorado 80501

———— HAVE FUN !

Tom F Mihok O.D

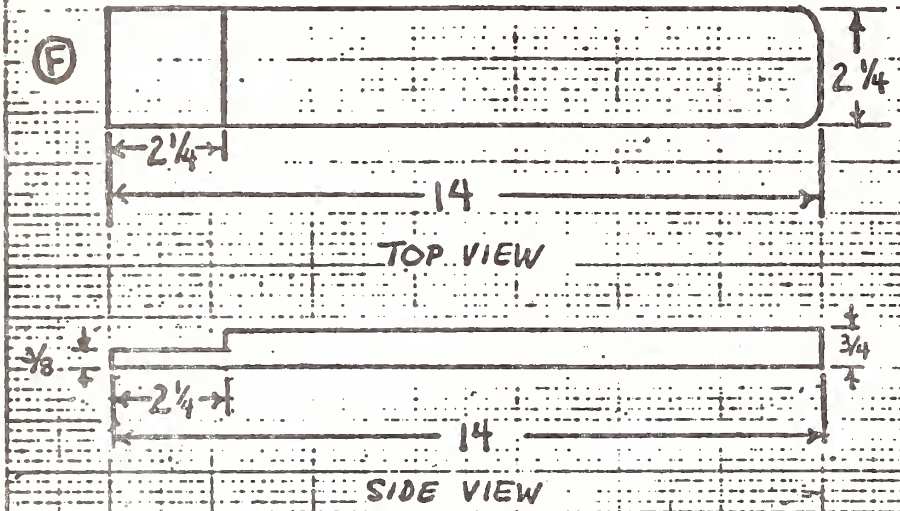

Ⓐ
1 3/4
arm
14
Ⓑ
1
stabilizing bar
12 1/2
3/4
2
Ⓒ
2 1/2
TOP VIEW
3/4
3/8
SIDE VIEW
Ⓓ
2
1 1/2
attach this end to bottom of plat
Ⓓ
Ⓒ
Ⓒ
brace for platform
attach this end to arm
brace (bottom of platform view)
12
18
platform (can be made from 1/2" ply)
2
this end attaches to brace for platform
attachment for stabilizing bar 1/8" masonite on both sides
Ⓐ
Ⓑ
this end attaches to base of stand
design & drawing by:
T. [illegible] O.D.

Ⓔ



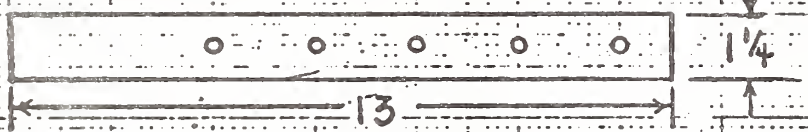
base - front

Ⓕ



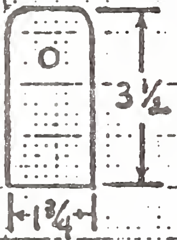
base - side

Ⓖ

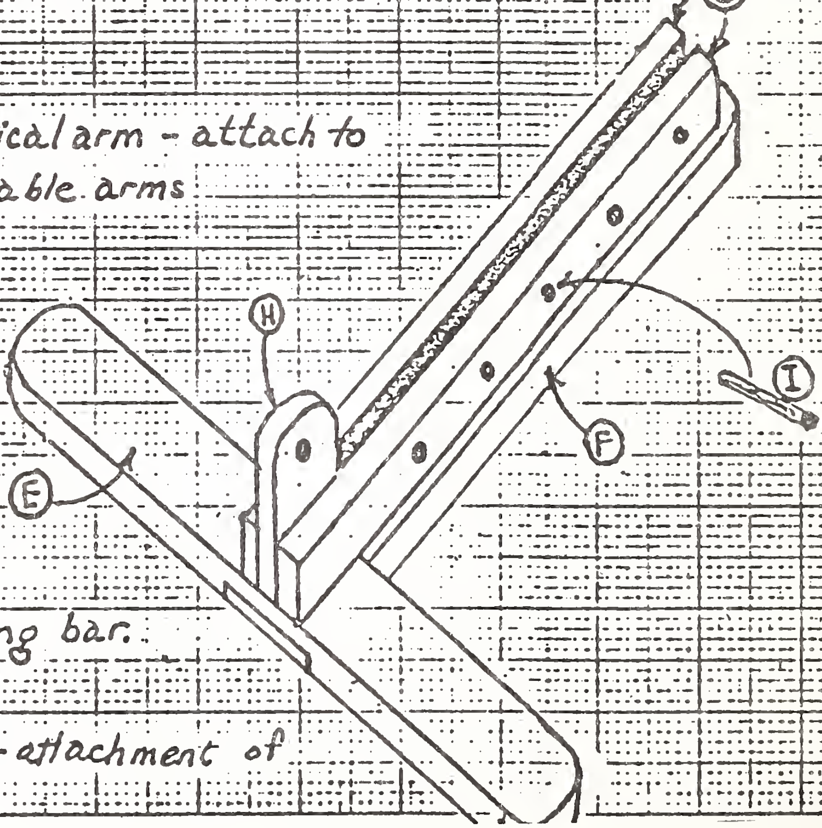


brace for stabilizing bar

Ⓗ



vertical arm - attach to moveable arms



Ⓘ

peg to attach stabilizing bar.

Use 'C'- clamps for attachment of base to table

SECTION IX

INTRODUCTION TO TRAINING WITH NEAR AIDS

This section will be discussing the advantages and disadvantages of the various near aids. Suggested training procedures describing techniques and problems with the aids will also be provided.

I. Near Vision Aids
    a. Hand-held magnifiers
    b. Stand magnifiers
    c. Microscopes
    d. Telemicroscopes
II. Patient Understanding of the Aid
III. Problems Frequently Encountered
IV. Training Techniques
    a. Localization
    b. Omissions
    c. Tracking
V. Reading

NEAR VISION AIDS:

Hand-Held Magnifiers:

- most common aid
- good for short-term reading - spot reading
- disadvantages
  - both hands occupied: one holding the magnifier, other holding the material
  - farther away from the eye-smaller the field of view
  - not held correctly - magnification will vary

Stand Magnifiers:

- automatically sets the working distance - sits directly on the paper
- patient usually wears reading Rx or bifocal
  - keep in mind the power of lens for working distance
- stronger the device, closer to the eye - to get a clear picture and reasonable field of view
- disadvantages:
  - both hands occupied
  - patient tends to use the aid on a table and bad posture may result (leaning over the table)

Microscopes:

- spectacle mounted
- both hands free
- disadvantages:
  - close working distance - 4" - ¼"
  - very critical working distance - vary ½" - blur
  - small field of view - 2" or less
  - patient must look through center of microscope for best optics otherwise a distorted picture
  - patient must move the material or one's head
  - distant vision completely blurred out

Telemicroscopes:

- perform near point tasks at 8" to 12"
- disadvantages:
  - very critical focus point - ½" variation - blur
  - small field of view
  - depth perception affected - keep finger in field to help eliminate depth & distance judgements

TRAINING AT NEAR

Understanding the microscope or magnifier: use and limitations

- short working distance - closeness will not harm eye(s) due to the optics of the lens
- small field of view
- no-eye movement - aberrations in periphery of lens
- near use only - no walking around
- patient will be using one eye with the microscopes - due to close working distance - will not affect either eye negatively.

Problems Frequently Encountered:

- moving one's eyes instead of head or reading material
- maintaining the close working distance
- small field of view causes problems with long words - may have to read in syllables
- recognition of certain letters with similar letters: a/e/c
- find one's place - localization
- going from one line to the next or even from word to word
- fatigue or strain causing: jumping of letters
    - page whiting or blacking out
    - eye watering
- slow reading
- substitutions
- **start with larger print than the patient can acquire through magnification

Jumbled Alphabets:

- look for:
    - localizating problems: knowing where to start: find upper left corner and go down; if he/she should stop reading, mark line with a pen or clip
    - omissions: start with large spacing between letters and cut down spacing gradually; count the number of letters in a line then read it. To practice you can use nonsence words normal spacing so no guessing can be involved.
    - use a pointer or typoscope to go across the line
    - skipping of lines - use a Typoscope, keep a finger at the line the patient is reading; follow back over the line just read and drop down: tracking sheets (saccades) to learn movement
    - letter mistakes: find out if it is due to not knowing the letter or not seeing the letter's details (a/o/e/c). give the same letter in large print to find the answer; if it is due to details, have the patient describe it (is it straight, rounded, etc.)

Reading:

- never start with the newspaper
- also keep in mind the patient's educational level and reading proficiency

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SECTION X

INTRODUCTION TO TRAINING WITH DISTANCE AIDS

The following section will discuss training procedures sequence of presentation, advantages and disadvantages as well as special considerations involved in training with distance aids.

- I. Telescopes
    - A. Discussion of patient's fields
    - B. Mechanics of the Aid
    - C. Techniques of Localization
        - 1) Common problems
            - a) Nystagmus
            - b) Scotomous Fields
    - D. Focusing
    - E. Indoor and Outdoor Training Activities
- II. Bioptic Telescopes
    - A. Considerations
    - B. Techniques of Location
    - C. Indoor and Outdoor Training Activities
- III. Reversed Telescopic System
    - A. Types
    - B. Techniques of Localization
    - C. Indoor and Outdoor Training Activities
    - D. Advantages/Disadvantages
- IV. Fresnel Prisms
    - A. Explanations
    - B. Placement
    - C. Training
    - D. Special Considerations

TRAINING WITH DISTANCE AIDS

I. Telescopes

A. Discussion of patient's visual fields

This is done especially if any scotomas or constricted fields exist. Patient should have a good understanding of location and functional implications of constricted or scotomous fields. Understanding should be such as to enable him/her to use the most effective field of view. Many patients do not have a functional grasp of their fields and, without this, training in localization becomes more difficult.

B. Mechanics of the Aid

Patient should be familiarized with the structure and optics of the aid. This, of course, should be presented in a manner commensurate with each's individual's level of understanding. Effect of reduced fields, need for slower rate of scanning, and reduction of light should be covered. Instructions in the upkeep and cleaning of the aid should also be provided.

C. Techniques of Localization

Methods for spotting, movement from gross to fine visual cues and eventual localization of target is stressed here. (see attached references)

1. Common problems:
    - a. Nystagmus - searching techniques are made more difficult, unless patient is instructed to hold scope in steady position once target is found. Common tendency is to move scope when eye moves. Patient should be instructed to maintain position of scope and wait for eye movement to return to previously located target.
    - b. Scotomous Fields - if initial stress is not placed on understanding of location of scotomas, localization is difficult and tedious. Once best field is located, patient should be instructed to purposely move his/her eye slightly to right, left, up and downward of best area. This reinforces the point that slight eye movement will bring patient into his/her scotomous area and cause disorientation and frustration. Movement of head, not eye should be stressed and reinforced.

D. Focusing

This is initially done for the patint by the trainer, so that patient has only to concentrate on one thing at a time. After localization has been mastered patient is shown how to focus the aid independently. Once best point of focus has been found, patient should be instructed to change focus to the right and left, to reinforce the idea that slight movement to either side can distort and blur image. Some patients look through improperly focused aid and feel it is the result of their vision and not the aid. They, therefore, do not change the focus and the image remains clear. Emphasis should be placed on blurring out and clearing up the image to reinforce proper focusing.

NOTE: Initial check should be made on patient's clarity of image, after trainer has focused for him/her. If image is clear for trainer and blurry for patient or vice versa, be alerted to the fact that a refractive error may exist and patient (or trainer) should be referred back to the eye specialist.

E. Indoor and Outdoor Training Activities

1. Indoor activities should be taught first. Try to make the activities as functional as possible for the individual's needs (e.g. if patient is a student, you might begin with chalkboard activities) In some cases, lighting is insufficient indoors. If the patient is having difficulty due to contrast, and lighting cannot be increased, move to outdoor activities where more success is usually exhibited. (see attached references)
2. Outdoor activities should include location of street signs, traffic lights, house and bus numbers, store signs and whatever patient expresses an interest in seeing. Emphasis should be placed on techniques of scanning. (see attached references)

II. Bioptic Telescopes

A. As in training with telescopes discussion of patient's visual fields and mechanics of the aid should be covered first. Explain that telescope is mounted in upper portion of carrier lens. Since the telescope is afoval, stress is placed on localization and use of bioptic in stationary and dynamic situations.

B. Techniques of Localization

Patient should be instructed to drop his/her head slightly and raise eyes from carrier lens to telescope. Maximum eye movement and minimum head movement should be stressed. Practice and reinforcement in coordinating head and eye movement should be given a priority.

C. Indoor and Outdoor Training Activities

1. Training should begin with activities centered around location of stationary objects in the bioptic field. With patient in stationary position, stationary object is located through carrier then bioptic lens.

2. Moving objects are then located as above.

3. Patient then moves through the environment locating moving objects.

4. If system is to be used for driving, emphasis is placed on identifying potential hazards, first walking then travelling as a passenger in a motor vehicle

5. When these activities have been satisfactorily mastered, the patient then drives, under the supervision of trainer. (see attached bibliography)

IV. Reversed Telescopic System

A. Types:

1. hand-held - patient's field of view is widened by reversing the telescope such that objective instead of ocular lens faces the eye (2.5x and 2.8x hand-held scopes are most appropriate)

2. bioptic reversed telescopes - same principles as above except that telescopes are mounted in upper portion of carrier lens.

B. Techniques of Localization

Same as those for above - mentioned bioptic telescopes (exclusive of independent operation of motor vehicle)

C. Indoor and Outdoor Training Activities

1. As with bioptic telescopes activities progress from indoor static to outdoor dynamic tasks.

2. Due to effects of minification and apparent increased distance from viewer to object concentration should be placed on apparent and actual distance estimations.

D. Advantages/Disadvantages

1. Main advantage is that individual with severely constricted fields is provided with a system which minifies objects, thus allowing a wider view to be compressed into a small visual field. As opposed to gross head scanning, individual needs only to move eyes to gain wide scope of area to be viewed.

2. Disadvantages for outweigh advantages:

   a. reduced acuity
   b. reduced illumination

- c. difficulty in transferring from carrier lens to scope
- d. problems with distance judgement
- e. cosmetics
- f. expense

V Fresnel Prisms

A. explanation of patient's fields of view and functional implications of enhancement with prism. Emphasize that and not only awareness within field, actual field is increased.

B. Placement

1. A perimentry field reading must precede placement, to eliminate possibility of peripheral islands of vision.

2. Place strips of cardboard temporal to patient's field of view and instruct patient to walk around, indicating if cardboard interfers with field of view. If no interference place edge of prism 1 mm temporal to this point.

C. Training

Patient should practice eye movement, looking in and out of prism.

1. As this awareness is being established, emphasize optics of prism (i.e., displacement factor)

2. Begin with static activities, having patient judge apparent and actual location of his/her hand, while viewing through prism. Kinesthetic awareness reinforces success in judgement.

3. Patient then estimates apparent and actual location of stationary and moving objects.

4. Training then emphasizes apparent and actual location of stationary and moving objects while moving through the environment, first indoor and then outdoors.

5. Outdoor activities should eventually be centered around functional travel situations (eg crossing traffic intersections, traveling in crowded areas, etc)

6. Smooth scanning techniques prior to and after placement of prism should be emphasized.

D. Special Considerations

1. In reference to visual fields, those patients with 10° fields or less will generally be more successful. The smaller the field of view, the greater the chance of optimum enhancement.

    a. patients with greater than 10° fields will generally benefit more from training in scanning techniques.

2. The sharper the acuity, the better the chance for success. Patients less than 20/200 will generally not benefit from the prisms.

3. Individuals frequently complain of glare problems with fresnel prisms. For optimal success, prisms should be placed on tinted or sun lenses.

TRAINING WITH DISTANCE AIDS

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